pp. 801–884] [September, 1946

TROPICAL DISEASES BULLETIN

IMPERIAL MYCOLOGICAL INSTITUTE
5 NOV 1946
IMPERIAL MYCOLOGICAL INSTITUTE 1946

VOL. 43.] 1946. [No. 9.

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Issued under
the Direction of the
Honorary Managing Committee of the
BUREAU OF HYGIENE AND TROPICAL DISEASES,
Keppel Street, London, W.C.1.
(Telephone: MUSEUM 3041)

Price 2/6 Net.] *Entered as Second Class Matter in the U.S.A. Post.* [See p. viii for announcement of Annual Subscription Rates.

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BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

Vol. 43.] 1946. [No. 9.

BLACKWATER FEVER—MODERN THEORIES.

A Critical Review.

By B. G. Maegraith, B.Sc., D.Phil., M.B., B.S.

Alfred Jones, Professor of Tropical Medicine, Liverpool School of Tropical Medicine (University of Liverpool).

Aetiology.

Blackwater fever is still considered on fairly good grounds to be a complication or sequela of malaria. It is most often found in endemic and hyperendemic malignant tertian regions, but may be associated with benign tertian or quartan malaria. Plasmodia are found in the peripheral blood in about half the active cases. Blackwater may appear in individuals who have left the tropics and are residing in temperate or cold climates. It may develop subsequently to artificially induced malaria. Kitchen and Sadler (1945) have recently described such a case, in which three plasmodial species were used therapeutically in succession, *P. falciparum* being introduced by mosquito bite. In spite of treatment *P. falciparum* persisted in the peripheral blood for about five months. At the end of this period the patient was given a further course of quinine therapy and developed blackwater fever some hours after the first day's treatment. All the malarial strains used in this case were well known and none had any previous history of being associated with haemoglobinuria. The authors therefore suggest that the prolonged parasitaemia may have been an aetiological factor; the quinine administration may also have been significant. The relationship of quinine administration to the onset of blackwater fever has frequently been noted. For instance, in the West African Command in 1941–43, haemoglobinuria developed in a high proportion of cases during oral quinine therapy for malignant tertian malaria. Moreover, Findlay is quoted (Skipper and Haine, 1945) as stating that in the same Command the incidence of blackwater fever diminished considerably after the introduction of mepacrine in place of quinine for treatment and suppression of malaria.

Various attempts have been made from time to time to determine the rôle of antimalarial drugs in the genesis of blackwater fever, but apart from clinical observations such as those mentioned above, the results of experiments on these lines have been equivocal. Recently Zylmann (1944) compared the lytic action on human red cells (both from normal and malarial subjects) of equivalent solutions of quinine and atebrin and observed that, whereas quinine had a lytic effect on all cells, atebrin acted more vigorously on cells from malarial patients. He concluded that atebrin had a true lytic effect. Most authors,

however, are agreed that atebrin has, in fact, very little effective haemolytic action, either when given in massive doses or in small doses over long periods (MAEGRAITH and HAVARD, 1945; Army Malaria Research Unit, 1945, etc.).

Haemolysis.

The most striking phenomenon in blackwater fever is the intense haemolysis, which involves both parasitized and unparasitized cells. Such haemolysis is closely related to that seen in relatively minor degrees in malaria uncomplicated by haemoglobinuria. The mechanism of its production is not understood. No identifiable circulating haemolysin has so far been isolated, although the early experiments of FOY and KONDI led them at first to conclude that a "circulating haemolysin" existed in the circulation of the blackwater fever patient. These workers (1941) transfused normal red cells into an actively haemolysing case of blackwater fever and found that the introduced cells were destroyed very rapidly, and were therefore apparently as susceptible to lysis as the cells in the patient. An extension of these experiments by FOY and his colleagues (1945) showed that cells from a blackwater fever patient were equally readily destroyed in a normal circulation and, further, that the plasma from an actively haemolysing case of blackwater fever did not precipitate a haemolytic crisis when injected into a patient suffering from malignant tertian malaria. These authors have therefore concluded that in blackwater fever the fundamental factor is probably "extracellular, and can haemolyse normal cells as well as bring about changes in the blackwater fever cells that render them susceptible to destruction, even in normal circulations." This latter point is emphasized by the further observation of FOY and KONDI (1943) that blackwater fever cells are more fragile than normal cells in a lysolecithin system, although, as other authors have also reported, their fragility in saline is normal. This increased susceptibility of blackwater fever cells *in vitro* to lysolecithin indicates that this substance may play a part in the haemolysis of blackwater fever, possibly by its action on the lipoid-protein complex of the cell membrane. There is some evidence, *e.g.*, the appearance of spherocytosis (FOY and KONDI, 1943, and others) that this latter may be altered in blackwater fever, with concomitant changes in permeability.

A splenic factor has often been considered as a possible agent in the lysis occurring in blackwater fever, mainly on the analogy of the part played by this organ in other haemolytic states. VINT (1941) for instance, has pointed out that enlargement of the spleen might increase the degree of separation of erythrocytes and plasma in that organ (KNISELY, 1934; FAHRAEUS, 1939). Such increased separation would work with existing anaemia (such as, for instance, that occurring in malignant tertian malaria) towards reducing the effective erythrocyte-plasma interface, so that the so-called stabilizing substance (FAHRAEUS), which is thought by some to be lysolecithin,* would be ineffectively adsorbed and thus become potentially active as a lytic or pre-lytic agent. This possibility has been recently discussed by FOY and KONDI (1943) and in more detail by GEAR (1946). The latter author further suggests that the spleen may function in blackwater fever as a reservoir of a hypothetical autohaemolysin (see later). This haemolysin would accumulate when the splenic circulation was impeded, as it is in the enlarged spleen of malaria, and might be thrown out suddenly into the general circulation by splenic contraction, thus accounting for the sudden onset of haemolysis often seen in blackwater fever.

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* LASER and FRIEDMANN (1945) have recently isolated a haemolytic substance from human plasma which is nitrogen- and phosphorus-free and cannot therefore be lysolecithin. *In vitro* haemolysis brought about by this agent is inhibited in a remarkable way by antimalarial drugs, and Laser suggests that "malaria parasites at some stage of their development produce a metabolite closely related "to this natural haemolytic substance."

SMITH and EVANS (1943) consider that changes in blood *p*H may affect the rate of haemolysis. These authors found red cells resistant to saline haemolysis in alkaline solutions and highly susceptible in acid solutions. They suggest, therefore, that the degree of acidosis occasionally met with in blackwater fever may account for the increased haemolysis. Similar effects of *p*H have been noted by DACIE and RICHARDSON in cases of chronic haemolytic anaemia with nocturnal haemoglobinuria, and recently BIRNBAUM and his associates (1945) have shown that the addition of alkali to bile solution delays its lytic action on both normal and malarial red cells. The latter authors conclude from their experiments that, although acidity may thus play some part in haemolysis, sensitivity to lysis is primarily a function of the cell itself and not of its external environment.

An alternative hypothesis has been put forward by MAEGRAITH, FINDLAY and MARTIN (1943), who discovered that animal tissue contains a heat-labile lytic agent, which is normally inhibited by factors present in tissue washings and serum. They suggest that the rate of lysis occurring in an animal at any one time may be a function of the balance between the tissue lytic factor and its inhibitors. Sera from actively haemolysing blackwater fever cases were found by these authors to inhibit the lytic agent much less effectively than normal sera, indicating that in blackwater fever the balance between the lytic agent and the inhibitory factors is shifted to the lytic side. In blackwater fever, therefore, " there exists no abnormal lysis ; rather the lysis is simply a manifestation of excessive uninhibited activity of the normal lytic process." The mechanism of reduction of activity of the inhibitory factors in blackwater fever is unknown ; possibly the plasmodial infection or the exhibition of antimalarial drugs, or both, may be concerned. PONDER (1944) has repeated the experiments of Maegraith and his colleagues and has confirmed their findings as far as the lytic effects of tissue are concerned. He considers the tissue lytic agent to be similar to lysolecithin. BRUCKMANN and WERTHEIMER (1945) have also confirmed the presence of the tissue lytic agent, which, however, they consider is not connected with normal or pathological blood destruction. It is not unlikely that the lytic agent observed by Maegraith and his co-workers is identical with the crystalline haemolytic substance recently isolated from human plasma by LASER and FRIEDMANN. Evidence of a similar lytic factor has also been recorded recently by BROWN *et al.* (1944) in the course of an investigation of the fate of transfused red cells in various forms of anaemia.

Recently GEAR (1946) has suggested that the lysis in malaria and blackwater fever may result from a haemolysin developed as the result of the plasmodial invasion of the red cells. On the analogy of the experiments of SCHWENTKER and COMPLOIER (1939), who found that emulsions of homologous kidney and brain were autoantigenic if injected into rabbits after being mixed with bacterial toxins, GEAR suggests that the red cell when invaded by plasmodia may become autoantigenic, giving rise to an autoantibody (haemolysin), which, in the presence of complement, is able to lyse homologous red cells. A somewhat similar suggestion has been made by BUTTS (1945) who believes that a factor concerned in the haemolysis of blackwater fever may be iso-immunization to an Rh-like substance present in malarial plasmodia. His assumption is based on what he states to be the comparative incidence of blackwater fever and erythroblastosis foetalis in white and negro races. BENIANS (1944) has also pointed out the possible rôle of autoantibodies in blackwater fever considered purely as a haemolytic disease. He considers that the presence of such antibodies is indicated by the difficulties encountered in cross-grouping the blood of blackwater fever patients for transfusion.

OLIVER-GONZÁLEZ (1944) has suggested that the malaria parasite may contain an antigen related to human isoagglutinogens, and that autoagglutination,

which is frequently met with in blackwater fever, may result from immunization with such a substance. There is some evidence that the malaria parasite can behave in this way, as α and β agglutinins are often increased during the disease. This author found cold agglutinins in the sera of two cases of blackwater fever. It is interesting to note here that BENIANS has demonstrated similar cold agglutinins in severe Raynaud's disease.

A good deal of the pigment liberated by haemolysis in blackwater fever is removed by phagocytosis by reticulo-endothelial cells and converted into bilirubin, which is absorbed by the liver cells in the usual way and eventually appears in the bile. Some degree of hyperbilirubinaemia is thus not uncommon in blackwater fever. When the haemolysis is so severe that the normal mechanisms cannot deal with all the liberated blood pigment, the degree of hyperbilirubinaemia is such that the patient becomes jaundiced. Some of the excess haemoglobin pigment is passed in the urine as oxyhaemoglobin (red : common in alkaline urine) or methaemoglobin (dark reddish brown : common in acid urine), but some remains in the plasma in the form of oxyhaemoglobin and methaemoglobin.

FAIRLEY and BROMFIELD (1934) investigated the pigments present in the plasma of blackwater fever cases and found evidence to suggest that haemolysis was mainly intravascular, the plasma methaemoglobin being apparently derived from the haemoglobin of the lysed cells. These authors observed a further peculiar haemoglobin derivative in one of their cases, which they later called pseudo-methaemoglobin. This pigment was found to be present constantly in severe blackwater fever, and in a series of elegant experiments, FAIRLEY (1938, 1939, 1941) showed that it is formed from free haemoglobin after massive intravascular haemolysis, and can be synthesized in man and monkeys after intravenous injection of alkaline haematin. Methaem-albumin, as this new compound is now called, does not pass through the kidneys. It is apparently ultimately removed from the plasma by the liver.

Renal Function.

About half the deaths in blackwater fever are associated with kidney failure (STEPHENS, 1937). Renal function may become affected at any stage of the disease, independently of the passage of haemoglobin in the urine. Failure is indicated first, in most cases, by a reduction in urinary flow which may go on to complete anuria. Recovery from anuria is rare and is usually followed by polyuria, which may last a week or more. During this period the concentration of the urine is greatly reduced, indicating renal tubular damage.

There has been extensive controversy over the mechanism of the production of renal failure in blackwater fever. Some authors consider that methaemoglobin in the presence of acid urine and an adequate concentration of salt gives rise to insoluble acid haematin which deposits in the renal tubules and so mechanically obstructs the flow of urine. MAEGRAITH and FINDLAY (1944), and others, have, however, pointed out that anuria frequently develops at a time when no blood pigments are being passed, that the salt content of the urine in blackwater fever is nearly always well below normal and that the urine is often alkaline or neutral when anuria supervenes. Again, heavy albuminuria with acid urine by no means invariably leads to anuria. These and similar observations have led many authors to the conclusion that the anuria of blackwater fever cannot be adequately explained on the grounds of mechanical obstruction by haemoglobin products (GEORGOPOULUS (1933), JOURNE (1944), PETERS (1945), etc.). In the search for a more satisfactory explanation, a great deal of attention has been paid to the action of circulating haemoglobin and (because of the similarity between the kidney failure in blackwater fever and that in crush syndrome)

myohaemoglobin on kidney function. For instance, YUILE, GOLD and HINDS (1945) injected solutions of haemoglobin into rabbits which were secreting acid or alkaline urine, and in which the kidney tubules were previously damaged either by temporary clamping of the renal pedicle (which was shown by SCARFF and KEELE (1943) to produce renal cortical lesions), or by previous poisoning with sodium tartrate. These authors concluded from their experimental results that precipitation of haemoglobin in the renal tubules is not primarily dependent on the reaction of the urine, but on non-specific "functional abnormality of the individual nephron" which could be produced either by the ischaemia or by chemical poisoning. Given the renal tubular damage and haemoglobinuria however, pigmented casts were more common in animals secreting acid urine than in those secreting alkaline urine. BYWATERS and STEAD (1944) recently reported that myohaemoglobin from dogs can similarly produce renal damage in shocked rabbits excreting acid urine, leading sometimes to anuria and death. These and similar experiments have shown that circulating haemoglobin and related pigments may, under certain conditions, be associated with renal failure, but, in otherwise normal animals, injection of these pigments has been found to have very little renal effect.

The existence in many diverse clinical conditions of the symptom-complex of oliguria or anuria associated with nitrogen retention and inability to concentrate urine, and frequently accompanied by degenerative changes in the renal tubules, but not necessarily related to the passage in the urine of blood or muscle pigments, has led MAEGRAITH and his colleagues to suggest that the renal failure in blackwater fever may be due to some cause, other than the circulating pigment, which is common to many other conditions. For reasons outlined below, these authors consider that the basis of such kidney failure is renal anoxia.

ALLEN pointed out in 1926 that the histological picture seen in kidney failure in acute malignant tertian malaria was similar to that of the "later stages of blackwater fever," the outstanding feature being marked degeneration of the cells lining the renal tubules. Such changes were not due to the malaria parasites themselves, which are usually scanty in renal tissue even when abundant elsewhere in the body. Many authors from time to time have tried to incriminate toxic substances liberated by the parasite during its development, or by the destruction of red cells at sporulation, but attempts to define this "malarial toxin," which is presumably present also in blackwater fever, have all failed. For instance, LINTWAREFF (1937) suggested that plasmodia produced a "toxin" which reversibly combined with haemoglobin to form a compound which acted directly on the renal tubular epithelium, giving rise to degenerative changes. He attempted to prove his theory by comparing the effects on the renal function of guineapigs of injection of haemoglobin solutions obtained from normal and untreated malarial subjects. His results and others of an equally equivocal kind leave the question of the existence of a soluble malarial "toxin" still unsolved. In the present stage of our knowledge it is therefore necessary to look elsewhere for the explanation of the kidney lesions in malaria and blackwater fever. RIGDON (1942) has put forward the view that the lesions of malaria result fundamentally from a state of anoxia in the tissues concerned. Such tissue anoxia may arise from lysis of red cells or interference with their oxygen-carrying capacity, or may develop as the result of alteration of the capillary blood flow through the tissue arising from stasis or mechanical obstruction (*e.g.*, by autoagglutinated and parasitized cells), or from generalized vascular constriction or collapse, such as is seen in shock. According to RIGDON's hypothesis, therefore, anoxia of the renal epithelium in blackwater fever may result in part from the malarial anaemia and in part from reduction in the effective tubular blood supply brought about not by physical obstruction by

agglutinated parasitized blood cells (which are rarely seen in large numbers in the kidney), but by changes in the intrarenal blood flow, associated with peripheral vascular disturbances of a general nature. SCARFF and KEELE (1943) have shown recently that degenerative changes can be produced in the renal tubular epithelium of the rabbit by restricting the blood flow to the kidney, and have noted the similarity between the lesions so produced and those seen in crush syndrome. Many authors have commented on the close resemblance between the lesions seen in the crush syndrome and blackwater fever (BYWATERS and BEALL, 1941 ; BYWATERS and DIBLE, 1942), so that it is possible that renal ischaemia may also play a part in the production of lesions in blackwater fever. Changes in renal blood flow have not yet, however, been demonstrated in blackwater fever, but there is some clinical evidence that they occur in other conditions in which the syndrome of renal failure may develop, such as traumatic shock (LAUSON *et al.*, 1944). The investigation of the renal circulation in malaria and blackwater fever by means of clearance tests would add considerably to our knowledge in this respect.

Treatment.

Antimalaria drugs.—Although the disease is generally considered to be a complication of malaria, most authorities consider that antimalaria drugs should not be given in blackwater fever. However, where parasites are present, it may be dangerous to leave the malaria untouched. There thus seems to be no reasonable argument against using antimalaria drugs under such conditions provided the drugs are not themselves possible haemolytic agents. As stated above, quinine is suspect and there is similar evidence to show that pamaquin may also actively stimulate haemolysis. There is, however, no evidence of any value indicating that atebrin is a haemolytic drug or has any effect on haemolysis *in vivo*. The drug can be taken as a suppressive for very long periods without haematological effects ; it can be given in large doses orally or intravenously without haemolysis ; it is said to stimulate the haemolytic effect of specific haemolytic amboceptor (ZYLMANN, 1944), but the evidence for this is poor. Finally, experience has shown that atebrin can be given safely in blackwater fever. If it is employed it should be given in adequate dosage and not limited to small and innocuous, but equally ineffective, doses, as sometimes recommended.

When parasites are not found in the peripheral blood, antimalarial therapy is not indicated. Frequently parasites appear after haemolysis has ceased and the patient has begun to recover. Under these circumstances again atebrin is indicated in full dosage.

Replacement of fluid and salt.—Fluid and salt may be lost by the patient in large quantities as a result of excessive sweating, vomiting or watery diarrhoea. As far as possible fluid loss (urine, liquid faeces, vomit) and fluid intake (including, of course, parenterally administered fluid) should be estimated, and the intake must be roughly balanced against the output. It is a serious mistake to push fluids too vigorously ; the patient, especially when anuric, can only too easily be waterlogged, with resultant oedema and circulatory complications (PARAMORE, 1945 ; *Bull. U.S. Army Med. Dept.*, 1945 ; MAEGRAITH, 1945). Fluids should be given when possible by mouth. If vomiting or coma prohibits this, intravenous infusion, by drip, of physiologically balanced saline solution is indicated. The infusion should be given slowly, and the amount must be controlled by the output/intake balance.

Transfusion.—As a good working rule, it can be reckoned that if the red cell count is 1·5 million per cmm. the carriage of oxygen to vital tissues is dangerously reduced. This makes transfusion necessary. Replacement of red cells can be

carried out by transfusion of citrated blood, by direct arm-to-arm transfusion or by injection of a concentrated cell suspension in physiological saline. The injection of citrated blood is liable to give rise to severe reactions, with rigors, due to so-called " pyrogens." Direct transfusion is difficult in tropical conditions, owing to sweat, dust, etc. Injection of concentrated cells is the best method if facilities are available. The fluid given with the transfusion must be calculated in estimating the daily fluid intake. As pointed out elsewhere, the agglutinins of the plasma may be increased in malaria and blackwater fever, and autoagglutination is common. It is necessary, therefore, before transfusion to *cross-match the donor's corpuscles with the patient's serum and vice versa.* Grouping is not in itself sufficient.

SMITH and EVANS (1943) have stated that transfusion is inadvisable when oliguria or anuria is present. This advice is apparently based on the possibility of lysis of the donor's cells. Such lysis does sometimes occur, but it is seldom severe, and must be risked if the patient's corpuscles are so few that the oxygen-carrying power of the blood is seriously reduced.

Alkalis.—Intensive alkali treatment of blackwater fever, based on the mechanical blockage hypothesis of BAKER and DODDS (1925), was first employed by HANSCHELL in 1925. The object of such therapy is to produce an alkaline urine and so to minimize the precipitation and deposition in the renal tubules of haemoglobin and its derivatives, so that mechanical blockage of the uriniferous tubules is prevented and anuria thereby avoided. Such therapy has been enthusiastically recommended and has had many advocates in recent years, some of whom go so far as to advise " enough alkali . . . to produce Trousseau's sign " (SMITH and EVANS, 1943). MAEGRAITH and his colleagues have recently criticized the basic hypothesis upon which alkaline therapy is founded and have pointed out that since the introduction of this form of treatment the death rate from blackwater fever has risen, not fallen. These authors point out that the frequently repeated advice that " alkali should be given until the urine becomes alkaline " is unsound, since, where kidney function is damaged, the reaction of the urine may remain unaffected by large doses of alkali. In any case, it is not established that anuria is less likely to develop if the urine is made alkaline (MAEGRAITH and HAVARD, 1944). Alkalis are usually administered as sodium salts, commonly the bicarbonate or citrate, or both. In reasonable doses, *e.g.*, not more than 20–30 gm. in 24 hours, these salts are not contra-indicated and may be useful in promoting mild diuresis. Given in large doses they may be dangerous (ARMY MALARIA RESEARCH UNIT, 1945). Alkalis are best given by mouth, but may be administered intravenously as sodium bicarbonate solution (150 grains to the pint). Sodium lactate may also be given intravenously.

The use of alkalis has also been advocated for dealing with the acidosis which is frequently said to be present in blackwater fever. The available evidence does not altogether support this contention. Acidosis, although occasionally reported (FAIRLEY and BROMFIELD, 1933 ; FOY, KONDI, and MOUMJIDIS, 1941), is not commonly seen in either malaria or blackwater fever.

Other substances.—The successful treatment of blackwater fever with antivenene has again been reported recently by SINGH and SINGH (1945), but the evidence brought forward is unconvincing. BURKITT (1943) has used sodium luminal [Phenobarbitonum Solubile], grains 8 to 10, intramuscularly with good results and quotes a series of 30 cases of blackwater treated successfully by GREGORY with intravenous injection of 15 grains of that drug. GEAR (1946) believes that the apparent success of such treatment results from the sedative action of these drugs, which minimizes splenic contraction and may thus prevent flooding of the circulation with (hypothetical) autolysin.

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SUMMARY OF RECENT ABSTRACTS.*

VII. HELMINTHIASIS.

[*Continued from p.* 701.]

Nematodes.

Hookworm Infestation, etc.—FERRO-LUZZI (p. 478) claims that until recently the problem of ankylostomiasis has not arisen in Eritrea, but that owing to the movements of troops and labourers from other countries, parts of Eritrea are now becoming endemic foci.

SMIRNOV (p. 135) has made studies on the rate at which hookworm larvae penetrate the skin of the hamster.

FLEMING (p. 48) reports a case of intractable diarrhoea, with high eosinophilia, due to hookworm infestation apparently contracted after a single exposure to infective mud.

From the study of the records of a large number of cases of hookworm infestation, KAMMER (p. 48) concludes that fever is a very uncommon symptom. Eosinophilia was a pronounced feature in a large proportion of patients admitted to a U.S. base hospital in the South Pacific during 1942–43. As a result of studies made on these cases, ALLEN (p. 49) concludes that hookworm infestation was largely responsible for this eosinophilia. CRUZ and DE MELLO (p. 1020) report, but cannot explain, a diminution of the excretion of sodium chloride in the urine of patients with hookworm anaemia.

In *Army Medical Department Bulletin, No. 47* (p. 742) it is noted that the recommended treatment for hookworm infestation [for adult British males, presumably] consists of 4 cc. tetrachlorethylene and 1 cc. oil of chenopodium, this draught being taken on an empty stomach and being followed, if necessary, by a dose of Epsom salts a few hours later.

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* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1945, v. 42. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

DUVOIR and BRUMPT (p. 913) describe the artificial infestation of patients suffering from polycythaemia, with larvae of *Ancylostoma duodenale.* The effect of this infestation on the disease was apparently beneficial, the number of red cells being reduced, and the symptoms relieved, in a few days.

EINHORN *et al.* (p. 911) have made five surveys of children in the Gorgas Hospital, Panama Canal Zone; they were infested with one or more of the common intestinal nematodes. MILLER *et al.* (p. 912) refer to these cases, noting that there were some infections with *Strongyloides stercoralis.*

WHITEHILL and MILLER (p. 576) describe a patient in whose urine larvae of *Strongyloides stercoralis* were found on several occasions, though they were absent from the faeces. The origin of the infection was not discovered. Treatment with gentian violet was successful. v. ENGEL (p. 49) describes a case of infestation with *Strongyloides stercoralis* in which apparent cure was obtained by means of gentian violet (1 per cent. solution) introduced slowly (50–60 drops per minute) into the duodenum. A dose of 250 cc. gave rise to continuous retching and slight collapse, but subsequent daily doses of 100 or 50 cc., given more slowly, for 5 days, apparently completed the cure. PALMER (p. 135) describes a case of infestation by *S. stercoralis* in which apparent cure was obtained by means of gentian violet given in enteric-coated tablets. The patient died (apparently of tuberculosis) but no *Strongyloides* could be found post mortem; larvae had been found in the faeces before treatment was started.

KASIMOV (p. 50) describes, for the first time, infestation of man by *Ostertagia ostertagi*, normally a parasite of cattle and sheep. He describes the specimen found. In comment, LAPAGE suggests that the worm may have been merely a passenger in the human intestine.

TSUCHIYA and RELLER (p. 817) report a case of infestation with *Trichostrongylus* in the United States, where it is exceedingly rare, though not uncommon in the sheep- and goat-raising areas of India and in Japan. They discuss the identification of the eggs of *Trichostrongylus.*

Ascariasis, etc.—GUHL (p. 51), writing in a Swiss journal, remarks that human ascariasis has increased enormously since the end of the war of 1914–18, and he suggests that this may be due to increased consumption of uncooked foods, which are often grown in gardens fertilized with human excreta. He describes two fatal cases in which these worms were found in the bile ducts within the liver. Treatment with anthelmintics is not capable of destroying the worms in the bile ducts, and surgical removal of the worms, with drainage of the bile ducts, may be necessary.

CHANG and CH'IN (p. 744) observe that in Szechwan, China, vegetables are grown in soil fertilized with human faeces, and are frequently contaminated by the eggs of *Ascaris.* They have shown that the process of pickling in brine, which is a common procedure for the preservation of these vegetables, does not ensure that all the eggs are destroyed. The infection may, therefore, be spread by the consumption of pickled vegetables, though other sources of infestation are, no doubt, more important.

EINHORN *et al.* (p. 914) discuss a series of children infested with *Ascaris*, and seen at the Gorgas Hospital, Panama Canal Zone; most of them were in hospital because of other diseases, of which the commonest was malaria. As usual, there was a high incidence of *Ascaris* infestation in early life. The symptoms are discussed [but the association with other diseases obscures them], the authors commenting that anaemia is not one of them and that eosinophilia is no index of the severity of infestation. The drug of choice for treatment is hexyl resorcinol. Details are given of cases in which *Ascaris* was regarded as the cause of death.

The complications due to *Ascaris* infestation, as observed at autopsy, are discussed by UNGAR (p. 745). He reports eight cases, in three of which there was intestinal obstruction with gangrene, in one invasion of the common bile duct, in one invasion of the pancreatic duct, and in three toxic damage to the intestinal wall, probably due to substances produced by the disintegration of dead worms. In most of these, the serious complications probably depended, not so much on the numbers of worms, as on the coincidence of other pathological factors. Details of these should be sought in the original.

CRAM and HICKS (p. 818) have demonstrated that eggs of *Ascaris lumbricoides* are very resistant to sludge digestion, either aerobic or anaerobic ; even after 6 months about 10 per cent. of the eggs are still viable. Drying in sludge kills them, and they cannot survive a reduction of moisture to below 5 per cent. Heating the sludge to 50°C. for 20 minutes kills half the viable eggs, and to 103°C. kills them all.

VINNITZKY (p. 746) has introduced living or dead *Ascaris lumbricoides* and *Toxocara canis* into the peritoneal cavity of certain animals, to study the reactions obtained. The findings cannot satisfactorily be summarized, and those interested should consult the original abstract.

MUKERJI and BHADURI (p. 919) describe a case of gnathostome infection of the eye, in Bengal. The infection was associated with orbital cellulitis and iritis, which cleared up when the worm was removed. The authors think that this belonged to the new species previously described by MAPLESTONE. In man, both adult and larval forms may be found ; the natural hosts are the cat and the dog, and man is probably infested by eating infested *Cyclops* or fish.

Filariasis.—CAUSEY *et al.* (p. 647) examined 5,000 persons at Belem, Brazil, where filariasis has long been prevalent ; an infection rate of some 12 per cent. was found, but the elephantiasis rate was only a fraction of this. The chief vector is *Culex fatigans*, which is also the commonest mosquito, but *Anopheles darlingi* and *A. aquasalis* were also found infected in nature. *C. fatigans* breeds well in polluted water, and one measure of control, therefore, would be the improvement of general sanitation and drainage.

In American soldiers in the South Pacific, ENGLEHORN and WELLMAN (p. 819) calculate that the shortest period between infection with *W. bancrofti* and the appearance of symptoms was 3 months, and that severe symptoms take 8 months to appear. The earliest symptoms are general, the local symptoms occurring later. All the patients in this group had funiculitis, many had orchitis and epididymitis ; a few had lymphadenitis and lymphangitis.

KING (p. 304) writes from an experience of 268 cases of early filariasis in American soldiers. The incubation period appears to vary from 3 to 16 months. The first symptoms are pain, swelling or redness of an arm or leg, or pain and swelling in the scrotal region. Sometimes there is slight fever, and the later symptoms may be classified as lymphangitis of the trunk or extremities, acute inflammation of the scrotum or its contents, and enlargement of lymph nodes. No microfilariae were found in the blood of these patients. The author thinks that clinical diagnosis is reliable, but has had fairly satisfactory results from the use of an intradermal test.

FOGEL and HUNTINGTON (p. 53) describe the genital manifestations of early filariasis as they have seen them in members of the American forces in the South Pacific ; no microfilariae were found in the blood or tissue fluids. Some constitutional symptoms were observed, and the signs included swelling and oedema of the spermatic cord, inflammation of the testes and adnexa, hydrocele, oedema of the scrotal skin and inguinal adenitis. No satisfactory drug treatment was discovered, but rest and support were beneficial. Operations on hydrocele, hernia and varicocele are contra-indicated.

GLAUSER (p. 479) also discusses filariasis in American Marines who served in Samoa. He observes that the psychological aspect of the disease was of considerable importance, but implies that the fears engendered were largely illusory ; there is no evidence that impotence or sterility is caused, and it is improbable that elephantiasis will develop in these men. No form of treatment was found to be effective.

JOHNSON (p. 478) reports on filariasis in U.S. marines from the South Pacific ; he makes the point that the longer the time these men spend in the United States after infection, the greater the improvement in their condition.

HODGE *et al.* (p. 1020) found microfilariae in two of 266 American soldiers with filariasis. They estimate that in a detachment of soldiers exposed to infection for about one year, though only 11 per cent. were found to have typical signs, the rate of infection will eventually prove to be in the neighbourhood of 50 per cent. Descriptions of the clinical signs, and of a skin test, are given.

ZUCKERMAN and HIBBARD (p. 480) have examined lymph nodes removed from patients with early filariasis. They state that biopsy is not necessary for diagnosis in most cases, but may be useful in some. Sections showed marked hyperplasia of the reticulo-endothelial cells, with hyperplastic and obliterative endolymphangitis, even in lymphatics in which acute lymphangitis had not clinically been present. This suggests a general reaction to a toxic product of the worm itself. Eosinophilia was intense in glands in which the filariae were also present, but not in others. There was no evidence that lymphangitis was due to bacterial infection. WARTMAN (p. 305) describes the pathological appearances of the lesions in lymph nodes and in lymphangitis, from some of the patients mentioned by King above. There is granulomatous inflammation around the worms and in the lymphatic sinuses.

CLEARKIN (p. 915) describes the technique and results of a skin test for filariasis, in which he uses an antigen prepared from *Dirofilaria immitis*. This test gave positive results in 91 per cent. of a group of infected persons, but has the disadvantage that it is not specific for *W. bancrofti* ; it may be positive in subjects with *Loa loa* or *O. volvulus*, or even with *Trichuris* or *Trichinella*. Nevertheless, a positive test in conjunction with clinical symptoms of filariasis in an area in which *W. bancrofti* is known to occur, can be taken as confirmation of the diagnosis of filariasis. OLIVER-GONZÁLEZ and BERCOVITZ (p. 219) have tried a precipitin reaction in filariasis, with an antigen prepared from microfilariae of *W. bancrofti*. The results were poor.

BYRD *et al.* (p. 479) give an account of the mosquitoes of the Samoan islands, and of their relation to *W. bancrofti*. Larvae of the latter were found in *Aëdes scutellaris pseudoscutellaris* [*Aëdes variegatus*] and *Culex fatigans*, but these larvae were in the infective stage only in the former mosquito in nature. VENNER (p. 478) found *Aëdes aegypti*, *Aëdes scutellaris pseudoscutellaris* [*Aëdes variegatus*] and *Culex annulirostris* on two islands of the Ellice group in which filariasis is endemic.

SCOTT *et al.* (p. 917) though recognizing that microfilariae have practically never been found in the blood of American soldiers who served in the South Pacific [but see HODGE, *et al.* above], have tested the infectibility of certain mosquitoes indigenous to California. They conclude that *Culex fatigans*, *C. erythrothorax* and *C. tarsalis* would be vectors if opportunity occurred.

BROWN (p. 53) treated 12 patients, infected with *W. bancrofti*, with anthiomaline, 19–50 cc. (60 mgm. per cc.) being given over a period of 13–26 days. Of the 11 in whom microfilariae were found, there was great reduction in the microfilarial count in 10, four to five months after completion of treatment. Anthiomaline is not the ideal drug for this disease, but these results indicate that further investigations of its value should be made.

JAFFE (p. 918) notes that X-ray therapy in cases of filariasis does not appear to influence the course of the disease, though some small benefit is given.

YU and MAO (p. 747) record *W. malayi* infection in a man who was reported never to have lived outside the provinces of Hupeh and Szechwan, in China. *Culex fuscanus* is susceptible to infection with microfilariae of *W. malayi*, but HU (p. 918) thinks that it would not be important in the lower Yangtze region, because it seldom enters houses or feeds on man.

FRANKS and STOLL (p. 916) describe a technique for the isolation of microfilariae of *D. immitis*, and the preparation of an antigen from them for use in a precipitin test. Parallel tests with an antigen prepared from adult *D. immitis* gave comparable results, but the authors think that the larval extract actually obtained was not so strong as the larvae were capable of furnishing.

SCHNELLE and YOUNG (p. 52) have investigated the periodicity of microfilariae of *Dirofilaria immitis* in dogs. The microfilariae appear in the blood about 8 months after infection, and there are two daily peaks, the maximum being in the evening. This pattern can be changed by altering the time of the principal meal of the day; exercise has no apparent effect. The authors quote evidence which suggests that the spleen is a reservoir for microfilariae.

BRADY *et al.* (p. 747) have traced the fate of injected antimony in dogs infected with *D. immitis*, by using compounds prepared from radio-active antimony. Nearly all the antimony left the blood in a few hours, and the greatest concentrations were found in the liver and thyroid. Antimony was also found in the adult worms. After 36 hours the amount excreted in the urine might reach 20 per cent. of the total injected.

CULBERTSON and ROSE (p. 136) have found Neostam and Neostibosan to be effective against the filarial worm *Litomosoides carinii* of the cotton rat.

NETTEL (p. 54) notes that microfilariae of *Onchocerca* may be found in skin or subcutaneous tissues far from the site of a nodule, and that, on the other hand, even in the presence of nodules the skin may be negative if the worms are immature or unfertilized. GERMAN (p. 819) describes a silver stain which gives better definition of larvae of *Onchocerca volvulus* than those commonly used. He describes the morphology of the larvae as displayed by this stain.

RODHAIN (p. 820) describes the pathological appearances of the lymph glands and skin in cases of onchocerciasis.

GARRATT (p. 649) describes two patients in Nigeria, each complaining of upper abdominal pain, and in each of whom liver puncture revealed the presence of large numbers of larvae of *Acanthocheilonema perstans*, though these were not found, or were scanty, in the peripheral blood. He therefore thinks that this infection was the cause of the symptoms. The second patient was treated with anthiomaline, and the numbers of larvae in the liver diminished greatly.

RODHAIN (p. 821) has found *Agamofilaria streptocerca* in Africans of the Belgian Congo.

Enterobius infestation.—LANE (p. 400) discusses infestation with *Enterobius*, showing that much is still to be learned about its life-history, and that treatment and prevention of infestation are still far from satisfactory.

MILLER and EINHORN (p. 578) discuss *Enterobius* infection in children seen at the Gorgas Hospital in the Panama Canal Zone. There is apparently a relatively high incidence in white children, as compared with negroes and those of mixed races, in spite of the better living conditions of the whites. This has been observed before, in the United States. Treatment by tetrachlorethylene was useless; quassia enemata were valuable, but gentian violet was the best drug.

SCHÜFFNER and SWELLENGREBEL (p. 922) have devised a method of examination which, in their hands, has given better results than the NIH swab and

other techniques. They use a glass pestle, ground slightly rough, with which they massage the perianal skin, moistened with water. The emulsion thus formed is transferred to a slide, and either examined under a coverslip, or dried and subsequently examined in cedar-wood oil. This method is much quicker than the NIH technique, and the authors claim that a simple washing procedure removes all *Enterobius* eggs from the pestle. By the pestle examination more positive results are usually found than by other techniques, and more eggs are seen. The same authors (p. 924) discuss further the detection of eggs of *Enterobius* in various situations. They produce more evidence that the pestle method is better than the NIH swab method, pointing out that the preparation of the faecal emulsion, which results from the use of the pestle, breaks up the clusters of eggs and facilitates detection. Examination of dirt from beneath the finger nails shows eggs quite often, but cannot replace the anal examination ; the fact that eggs are found there has an epidemiological importance. Samples of dust from schools in Amsterdam have shown very large numbers of eggs, especially in water-closets and in dining-rooms, but it is doubtful if eggs found in dust can develop if swallowed. For the examination of dust the authors prefer a floatation method with zinc chloride solution of specific gravity 1·33. Many details of technique are given in this paper.

PETERSEN and FAHEY (p. 920) have made an extensive survey of *Enterobius* infection in patients in a State mental hospital in the United States. Examinations, repeated many times in subjects who gave negative results, were made by applying microscope slides to the anal mucosa and the muco-cutaneous junction, as this technique was found to be as accurate as, and much more rapid than, the standard methods. In all, 59 per cent. of the inmates were infested, but the rate was much higher in those with chronic mental illness. Treatment with gentian violet, repeated if necessary, was very successful ; details of the doses used are given in the original abstract.

In a study of the effect of different temperatures and degrees of humidity on the eggs of *Enterobius vermicularis*, HELLER (p. 579) has shown that the optimum conditions for development are a temperature of 34°–36°C., and a humidity of 90–100 per cent. Higher and lower temperatures, and dry conditions, reduce the proportion of eggs able to hatch out infective larvae ; ventilation and drying of rooms, therefore, reduce the chances of spread of this infection. The conditions on the perianal skin appear to be close to the optimal for development.

LATIENDA and CARPANELLI (p. 137) discuss the question of appendicitis and infestation with *Enterobius*, without arriving at any firm conclusions.

Trichiniasis.—PIGOURY (p. 400) reports an outbreak of trichiniasis in Beyrouth, which is practically the only part of Lebanon in which pigs are reared. MÖNNIG (p. 401) quotes evidence which shows that trichiniasis is very rare in the pigs of South Africa.

MAZZOTTI (p. 219) has found that compression of 10 gm. of muscle gives better results in the detection of *Trichinella* infection than compression of a smaller quantity and digestion of a larger. As a result of his investigations he estimates the incidence of this infection in Mexico City at about 12 per cent.

MAZZOTTI and LOZANO HUBE (p. 55) have carried out a series of tests for trichiniasis in Mexico, by means of the intradermal reaction of Bachman. They give details of their results, but point out that these vary according to the standards laid down by different authors for a positive result. It is evident that more precise data are required before this test can correctly be evaluated.

GAASE (p. 481) reports a case of infection with *Trichinella* in which the complement fixation test was positive 15 days after the first appearance of symptoms ; the test was also positive with cerebrospinal fluid of the patient,

who had shown signs of meningeal irritation and cerebral involvement due probably to toxins, since no larvae could be detected in the brain substance.

TALICE (p. 305) discusses the symptoms of trichiniasis; there is no typical picture, but oedema of the face or of other parts, muscular pains, diaphragmatic signs, loss of weight, digestive, hepatic or gastric signs, and eosinophilia are relatively common.

WENDEROTH (p. 482) writes of the lesions of the cardio-vascular system in trichiniasis, noting particularly the occurrence of thrombosis in the lung, mesenteric veins, sigmoid sinus and saphenous vein. Myocarditis is common, but no larvae were seen in the heart muscle in the series of cases in the German army under consideration.

MATOFF (p. 579) has investigated the effects of introducing larvae of *Trichinella* into dogs, by various routes, in relation to any possible age immunity. The original abstract should be consulted.

LISBÔA (p. 817) reports infestation with *Dioctophyme renale* [*Eustrongylus gigas*], the largest of the parasitic nematodes, in a woman who passed a male worm in the urine. Infestation with this worm is very rare, and its life-history is not known.

HAWKINS and COLE (p. 912) describe work on the precipitates which form round the body orifices of exsheathed larvae of certain parasitic nematodes when they are immersed in the serum of previously infected animals.

Charles Wilcocks.

MALARIA.

DOELEMAN, H. **De malaria-epidemie te Middelburg in de jaren 1940 tot en met 1945, benevens een onderzoek van parasietendragers.**

This book is reviewed on p. 875.

SOTO, H. Reconocimiento paludico en una region del Valle de Medellin, Antioquia, Colombia, S.A. [**Malaria Survey in the Medellin Valley, Antioquia, Colombia.**] 25 pp., 6 graphs, 5 maps & 9 pls. [51 refs.] 1945. Oct. Bogotá: Talleres Graficos Mundo al Dia.

This is a malaria survey report of Medellin and Itagüí, two towns whose surburban extensions have met, making them a single agglomeration of 173,300 inhabitants. It lies high up in the middle of the valley of the Medellin River, Colombia, the inhabited area ranging from 1,455 to 1,950 metres above sea-level. It has a very equable climate; the annual mean temperature is 22·4°C. with very slight seasonal variation.

An examination of 3,700 individuals, from 5 to 19 years of age, revealed a spleen rate of 22·1 per cent. Malaria parasites were found in the blood of 309 individuals, 8·3 per cent., *P. vivax* 289, *P. falciparum* 35 (15 mixed infections). *P. malariae* was not seen. Four species of *Anopheles* were found: *A. eiseni*, *A. pseudopunctipennis*, *A. punctimacula* and *A. argyritarsis*. *A. eiseni* was found breeding in only a limited area which is not malarious. *A. pseudopunctipennis* and *A. argyritarsis* were found breeding in abundance; larvae of the latter species formed more than half of the total anopheline larvae identified. Neither of these two species appears to have any predilection for human blood and neither was found frequenting human dwellings in any numbers. They are unimportant as vectors of malaria in Medellin. *A. punctimacula*, on the other hand, predominated in captures in human dwellings. Of 664 females so captured, oöcysts were found in 12, 1·8 per cent. It is the chief malaria vector in Medellin and Itagüí.

Norman White.

REY, H., SOTO, H. & HUFFAKER, C. B. *Anopheles punctimacula* **D. & K. as the Vector of Malaria in Medellin, Colombia, South America.** *Amer. J. Trop. Med.* 1945, Nov., v. 25, No. 6, 501–5. [24 refs.]

ALBERTO ALVARADO, C. Memoria de la dirección general de paludismo correspondiente al año 1944. [**Report on Malaria in Tucumán for 1944.**] 72 pp. 1945. Tucumán, República Argentina: Ministerio del Interior, Dirección Nacional de Salud Pública.

BLACK, R. H. **A Preliminary Note on the Cultivation in Vitro of New Guinea Strains of Human Malarial Parasites.** *Med. J. Australia.* 1945, Dec. 29, v. 2, No. 26, 500–501.

Blood serum is obtained by placing 20–30 cc. of blood in a large test tube containing 0·1 cc. of 50 per cent. glucose solution, and stirring for 5 minutes till defibrination is complete. The serum is separated by centrifugation and placed in a flat-bottomed tube about ½ inch in diameter to give a column of serum 1½ to 2 inches high. Red cells infected with *P. falciparum* are obtained from beneath the leucocyte layer after centrifugation. These are introduced into the bottom of the serum tube, which is incubated at 37°C. During the course of 28 hours schizogony, followed by invasion of new red cells, was observed. At 78 hours forms which resembled gametocytes appeared. At five days parasites were scanty, but subculture into fresh serum containing red cells and glucose gave a result similar to the initial culture. *C. M. Wenyon.*

HEIDELBERGER, M., MAYER, M. M. & DEMAREST, C. R. **Studies in Human Malaria. I. The Preparation of Vaccines and Suspensions containing Plasmodia.** *J. Immunology.* 1946, Apr., v. 52, No. 4, 325–30, 1 fig. & 2 pls.

As the authors point out, little is known about the chemical and immunological properties of human malaria parasites, largely on account of the scarcity of material for study. During the recent war, concentrates of parasites were prepared from heavily infected human blood by the method of differential centrifugation, and by the use of an unsymmetrical magnetic field, which acts on the haematin and related malarial pigments. The antigens were prepared in an attempt to terminate relapses in chronic benign tertian malaria by vaccination of patients, for use in prophylaxis, and for studies on the immunological properties of the parasites themselves. In the first method, in which all operations were carried out in the cold, with aseptic precautions, the separated red cells were washed in formolized saline, lysed in chilled water saturated with carbon dioxide, and the dissolved haemoglobin was removed after the solid particles had settled. By centrifugation at suitable speeds the leucocytes and stromata of red cells were removed in turn. Several washings with a dilute merthiolate solution removed formalin from the final product. In the case of blood infected with *P. vivax* the best results were obtained when large pigmented forms were present, and 15–20 hours were required to deal with a 500 ml. sample.

The second method of separation, which is of academic rather than practical interest, was based on the observation of previous workers that Kupffer cells loaded with ferric oxide could be separated from tissue cells in a magnetic field. The present authors found that the pigment of infected cells behaved differently in a magnetic field from the haemoglobin of the normal red cells, and that parasitized cells in small volumes of blood could be concentrated by this means. An unsymmetrical magnetic field was obtained by the use of one pole-piece in the form of a cube, the other being wedge-shaped. A cell containing 20 ml. of citrated, parasitized blood, mixed with 10 ml. of 0·3 per cent. merthiolate in

saline, was moulded around the thin edge of the wedge-shaped pole-piece, and exposed to an intense magnetic field. Pigmented parasites were drawn towards the edge of the pole-piece and formed a thin brown streak on the wall of the cell. Convection currents were avoided by cooling with a fan, and the blood was so diluted that red cells settled in 6–12 hours. The brown streak, containing also some red cells, was separated along with the supernatant fluid and centrifuged. In the case of blood infected with *P. malariae*, 20 per cent. of the parasitized cells were recovered by this means, with a 140-fold concentration. In the case of *P. vivax* the recovery was 25 per cent., with a 15-fold concentration.

J. D. Fulton.

ROMEO VIAMONTE J. M. Los anophelinos de la Isla de Gran Canaria. [**The Anophelines of the Island of Grand Canary.**] *Rev. Sanidad e Hig. Pública.* 1946, May, v. 20, No. 5, 449–55, 17 figs. (15, 4 coloured, on 5 pls.)

During an investigation of malaria in the island of Grand Canary [see this *Bulletin*, 1946, v. 43, 283] the author examined 123 adult specimens of anopheline mosquitoes, of which 96 were *Anopheles* (*Myzomyia*) *hispaniola* and 27 were *A.* (*Myzomyia*) *sergenti*; the figures suggest a predominance of the former species as was noted by CHRISTOPHERS (*Indian J. Med. Res.*, 1929, v. 17, 518). The mosquitoes were caught in the following places :—Barranco de Arguineguín; Barranco de Ayagaures, Telde, Santa Lucía de Tirajana, and Tejada.

The distinguishing characters of these two species are described and figured.

J. F. Corson.

LUPASCU, G. Su alcune variazioni delle uova di *Anopheles maculipennis* var. *labranchiae*. [**Some Variations in the Eggs of** *A. m. labranchiae*.] *Riv. di Parassit.* Rome. 1941, June, v. 5, No. 2, 121–5, 7 figs. [10 refs.]

CORRADETTI, A. Le conoscenze sulla distribuzione delle specie anofeliche nell' Africa Orientale Italiana. [**The Distribution of Anopheles in Italian East Africa.**] *Riv. di Biol. Colon.* Rome. 1940, Dec., v. 3, No. 6, 419–29. [27 refs.]

ROZEBOOM, L. E. & KNIGHT, K. L. **The** *punctulatus* **Complex of** *Anopheles* **(Diptera : Culicidae).** *J. Parasitology.* 1946, Apr., v. 32, No. 2, 95–131, 7 pls. [34 refs.]

This paper reports interesting results, and is an excellent example of the kind of investigation that is required to elucidate the relationships of the very closely related but distinguishable groups of mosquitoes, which the practical culicidologist in the past has tended to designate as " varieties " of some well known species.

The authors believe that there are four good species of *Anopheles*, specimens of which would, before 1939, have been lumped together either as *Anopheles punctulatus* Dönitz, or *Anopheles punctulatus* var. *moluccensis* Swellengrebel & Swellengrebel de Graaf. It has already been pointed out by KNIGHT & FARNER [this *Bulletin*, 1945, v. 42, 688] that the form to which the name *moluccensis* applies was previously described by Laveran as *farauti* in 1902, and this name must therefore have priority. The four species are as follows :—*A. punctulatus* Dönitz (=*punctulatus* of recent authors). *A. farauti* Laveran (=var. *moluccensis* of recent authors). *A. koliensis* Owen [this *Bulletin*, 1946, v. 43, 6] described from Guadalcanal and considered by the authors of the present paper to be the same as the " intermediate forms " (between

punctulatus and *farauti*) from New Guinea. *A. clowi* Rozeboom and Knight, a new species described by the authors in the present paper from a single female reared from a larva taken near Humbolt Bay, Hollandia.

The authors' conclusions are based on biometrical data derived from the examination of series of specimens, many with associated larval and pupal pelts, and many bred from known females. They admit that they have not carried out all the cross-breeding experiments required to prove that the "intermediate forms," to which the name *koliensis* applies, are not hybrids, but this test was handicapped by the fact that females of *farauti* would not feed in the laboratory; the cross between *punctulatus* male and *farauti* female was therefore impossible under the conditions of their experiments. No hybrids were obtained when *punctulatus* females were given blood-meals and opportunities to mate with *farauti* males, though these females, on being given the opportunity to mate with males of their own species, did so at once and produced fertile eggs. *John Smart.*

DULANEY, Anna D. & WATSON, R. B. **Complement Fixation in Relapsing *Plasmodium vivax* Malaria.** *Amer. J. Trop. Med.* 1945, Nov., v. 25, No. 6, 473–80, 1 fig.

These observations, carried out at the Kennedy General Hospital, U.S.A. relate to 394 patients suffering from relapsing *P. vivax* infections, acquired in the Pacific war areas. All the patients were ambulatory, except for brief periods during malaria attacks; all were free from syphilis. The first group of 133 patients were studied during a six months' period; on them 287 coincident complement fixation tests and blood film examinations were made. On the second group of 261 patients, 6,220 complement fixation tests were carried out.

The antigen used was prepared from pooled *P. knowlesi* parasites of monkeys [COGGESHALL and EATON, this *Bulletin*, 1939, v. 36, 404; DULANEY, STRATMAN-THOMAS and WARR, *ibid.*, 1943, v. 40, 11]. Saline extracts of the dried parasites were used for all tests in the first group and a quarter of the tests in the second group. A phosphate buffer extract was used for the remaining tests [DULANEY and MORRISON, this *Bulletin*, 1945, v. 42, 352].

The results show that the complement fixation test is more sensitive than blood examination in detecting persistent subclinical infections (all the patients had received suppressive atebrin treatment). In the 6,507 coincident examinations there were 4,007 positive reactions, 62 per cent., but only 854 positive blood films, 13 per cent.

The patients could be classified into serological groups, the positive pattern (continued positive), the negative pattern (continued negative), and the changing pattern group. Eighty-eight per cent. of the positive pattern group relapsed as compared with 42 per cent. of the negative pattern group; 79 per cent. of the changing pattern group relapsed; series of positive tests at some time were recorded for all these patients.

In cases of relapse the complement fixation to blood film ratio on the day of attack was 0.7 : 1; after three days the ratio was 16 : 1, and after 6 days 80 : 1.

A series of negative complement fixation reactions with negative blood films over a sufficiently long period suggests the possibility of clinical cure; this period is more than six months.

A conservative attitude toward the test is recommended, an attitude which recognizes its limitations but appreciates the possibilities of its correct use.

Norman White.

TUMULTY, P. A., NICHOLS, E., SINGEWALD, M. L. & LIDZ, T. **An Investigation of the Effects of Recurrent Malaria. An Organic and Psychological Analysis of 50 Soldiers.** *Medicine.* 1946, Feb., v. 25, No. 1, 17–75, 11 charts. [42 refs.]

The object of this study of 50 soldiers, who had suffered an average of 10 recurrent attacks of *P. vivax* malaria, was to determine what organic alterations the malaria might have produced, and the relative importance of organic and psychological factors in the production of the symptoms displayed by these men.

The soldiers, six at a time, were admitted to a small separate ward in an Army General Hospital in the Pacific area, and each was studied during a period of 7 days. Forty-three of them were receiving suppressive therapy, at the time of the study, 40 with atebrin, 3 with quinine. The examination of each was very complete: detailed medical, social and psychiatric histories; complete physical examination; complete blood study, including fragility test; urine and stool examinations; serological test for syphilis; kidney function tests; liver function tests; tests for adrenal cortical insufficiency; basal metabolic rate; electrocardigram; teleoroentgenogram of the chest; special ophthalmological and psychiatric examinations; intelligence tests; and selected tests to measure certain phases of fatigue. The technique employed in carrying out these tests is described and the results are recorded in detail. A complete summary of this long report is not possible here.

There was no evidence in these patients that numerous attacks of chronic, recurrent, *P. vivax* malaria caused damage or dysfunction of the organ systems, other than the debility from which they suffered; all had been healthy young adults who had been exposed to reinfections for only six months, and their attacks of malaria had been treated early and adequately. In nearly all there had been loss of weight, and they were easily fatigued. Thirty-six patients had never complained of headache before the malaria; 26 of these developed chronic headache. Exertional dyspnoea was a common symptom. Anorexia and insomnia were complained of by 40 per cent. of the patients.

An analysis of the symptoms led to the conclusion that malaria was the prime factor in their production, but the individual's adjustment to the malaria, and concurrent situational factors, contributed to the development, perpetuation and intensification of symptoms. Once the symptoms had become fully developed, the soldier was of little value to the army, but if his morale remained satisfactory he was usually capable of remaining useful. Emphasis needs to be placed upon the handling of the person rather than simply of his malaria. Soldiers who have adjusted poorly in civilian and military life, and to overseas service, are likely to make a poor adjustment to malaria and to become incapacitated rapidly. Soldiers who develop chronic symptoms early in the course of the disease, anorexia, indigestion and insomnia, should be removed from units where marked physical exertion is required; their retention is harmful to themselves and to the "malarial morale" of their units. Minimal hospitalization reduced the tendency towards the development of neurotic patterns. *Norman White.*

COOK, C. D. & HOFFBAUER, F. W. **Liver Functional Impairment in Therapeutic Malaria with particular reference to the Unsuccessful Use of Methionine as a Protective Agent.** *J. Lab. & Clin. Med.* 1946, Jan., v. 31, No. 1, 56–64, 4 figs. [23 refs.]

Impairment of liver function has frequently been observed in patients undergoing malaria therapy. The observations described were designed to

determine what protection, if any, against such impairment is afforded by the addition of methionine to a general hospital diet.

Twelve patients suffering from neuro-syphilis were inoculated with citrated blood containing *P. vivax*, intravenously in 11 cases, intramuscularly in one. The plan of the therapy was to maintain fever of over 103°F. for a total of 50 hours, seven to eleven paroxysms. None of the patients had previously had malaria and none had a history of jaundice or infective hepatitis. In no case was there any evidence of hepatic disease at the time of admission.

All twelve patients were studied with regard to liver function before, during and after malaria therapy. The four laboratory tests used were cephalin-cholestrol flocculation, quantitative serum bilirubin, the quantitative Ehrlich reaction, and the bromosulphalein test. Six of the twelve patients received 8·1 gm. of methionine a day by mouth. All the patients were on a general hospital diet.

There was some evidence of disturbed liver function attributable to the malaria in all twelve patients. There was no evidence that methionine lessened that disturbance in any way. In ten patients functional abnormalities of the liver continued from one to three days after the termination of the malaria.

Norman White.

DE MELLO, J. P. **Malaria in Pregnancy.** *East African Med. J.* 1946, Jan., v. 23, No. 1. 25–7.

HANZLIK, P. J. & CUTTING, C. C. **Clinical Trials with Quinine-Epinephrine Intravenously.** *J. Amer. Med. Ass.* 1945, Dec. 29, v. 129, No. 18, 1241–3.

The investigation recorded was carried out to determine the safety of intravenous injection of quinine, as commonly used in the treatment of cerebral malaria, and the safety and value of epinephrine in preventing the circulatory depression to which intravenous quinine gives rise.

Intravenous injections of quinine-epinephrine were given to seven patients suffering from diseases other than malaria, three of whom were in coma from various drug intoxications. Fleeting circulatory stimulation was observed, chiefly an increase in heart rate. The blood pressure was moderately, though variably and temporarily, increased in four patients. The comas were unaffected.

The authors conclude that quinine-epinephrine intravenously is a safe initial treatment for patients with cerebral malaria. The dosage recommended is 0·5 gm. of quinine hydrochloride or dihydrochloride (or 0·69 gm. quinine bisulphate) and 1 mgm. of epinephrine, in 250 cc. of isotonic sodium chloride solution, injected in not less than 30 minutes. Not more than two or three such injections, properly spaced, should be given within 24 hours.

Norman White.

FLOCH, H. Le traitement économique du paludisme par la " quinine activée." [**Economic Treatment of Malaria with " Activated Quinine ".**] *Bull. Soc. Path. Exot.* 1945, v. 38, Nos. 11/12, 327–41, 3 figs. [11 refs.]

The necessity of economizing limited stocks of quinine prompted the use of adjuvants to reinforce its antimalarial action. Preliminary trials led to the adoption of the following prescription :—

Quinine hydrochloride	20 gm.
Resorcin	5 gm.
Methylene blue	0·5 gm.
Normal salt solution	250 cc.

After filtration through paper, the solution is put up in 2 cc. ampoules, which are then autoclaved for half-an-hour at 115–120°C. Each ampoule

contains 16 cgm. of quinine hydrochloride and 4 cgm. of resorcin. The treatment consists of two intramuscular injections a day, each of two ampoules, for six days. For a time all patients suffering from malaria, admitted to the Cayenne General Hospital, French Guiana, were treated in this way. Clinical notes of nine such cases are given ; they included both *P. vivax* and *P. falciparum* infections. The results were uniformly satisfactory. The author considers the results to be comparable to those obtained with three or four times larger doses of quinine without the adjuvants. The mixture can be given intravenously. There were no signs of intolerance. *Norman White.*

TRAGER, W., BANG, F. B. & HAIRSTON, N. G. **Relation of Plasma Level of Atabrine to Morphology and Motility of** *Plasmodium vivax*. *Proc. Soc. Exper. Biol. & Med.* 1945, Nov., v. 60, No. 2, 257–8.

When a single dose of atebrin of 200 mgm. is administered intramuscularly to a patient infected with *P. vivax*, at the time of the peak of concentration of the drug in the blood, which occurs within an hour of its injection, it is found that most of the larger amoeboid forms of the parasite have lost their motility and show a clumping of the pigment. Some hours later, when the atebrin level in the blood has fallen, many of the parasites will have recovered their motility and redispersed their pigment. It would seem, in view of this recovery after a single dose of atebrin, that when malaria is treated by intramuscular injection there is a need for repeated doses. After oral administration of quinine, giving plasma concentrations of 6 to 10 mgm. per litre, there was no loss of motility and no clumping of pigment within the first three hours. *C. M. Wenyon.*

MAEGRAITH, B. G., ADAMS, A. R. D., KING, J. D., TOTTEY, M. M., RIGBY, D. J. & SLADDEN, R. A. **Paludrine in the Treatment of Malaria.** *Brit. Med. J.* 1946, June 15, 903–5, 1 chart.

The authors' treatment of benign and malignant tertian malaria with paludrine has already been reviewed [this *Bulletin*, 1946, v. 43, 402]. Their present summary is as follows :—

" Paludrine is a colourless slightly bitter drug belonging to a class of chemical compound not previously known to have antimalarial activity. Unlike most other antimalarial drugs, it has been found to have an action on the exo-erythrocytic forms of the parasites in *P. gallinaceum* avian malaria.

" It has been used successfully in the treatment of benign tertian malaria (both in relapses and in delayed primary attacks) and in acute attacks of malignant tertian malaria (both primary cases and relapses).

" It has a very wide therapeutic range of activity. Doses of 10 to 750 mg. and of 50 to 600 mg. twice daily for 14 days have been used successfully in the treatment of benign and malignant tertian malaria respectively. No serious toxic side-effects have been observed with such dosages, although occasional nausea and vomiting may occur at dosages of 500 mg. or more twice daily.

" The administration of single doses of 50, 100, 200, 300, and 400 mg. will produce clinical cure of relapsing and delayed primary cases of benign tertian malaria. Similar effects have been obtained with single doses of 400 mg. mepacrine.

" Twice-daily dosage regimes for 14 days have no greater effect on the relapse rate of benign tertian malaria than full courses of mepacrine. The administration of one dose of 100 mg. weekly after treatment of the acute attack with a single dose of 50 to 400 mg. has so far been found to keep the patient free from relapses. The effect of this therapy over a period of six months is being investigated." *J. D. Fulton.*

KING, E. J., WOOTTON, I. D. P. & GILCHRIST, Margaret. **Estimation of Paludrine in Blood.** *Lancet.* 1946, June 15, 886–7, 1 fig.

The level of paludrine in the blood during the ordinary course of treatment varies between 10 and 100 μgm. per 100 ml. SPINKS & TOTTEY [this *Bulletin*, 1946, v. 43, 400] developed a method for estimation of paludrine in blood, plasma and tissues, which depends on hydrolysis, followed by diazotization and coupling, to give an azo dye. As little as 0.2 μgm. could be estimated in solution in the ordinary way, and it was possible to increase the sensitivity of the method by the use of special apparatus. The present authors have used an alternative method based on that described originally by BRODIE and UDENFRIEND [*J. Biol. Chem.*, 1945, v. 158, 705] and later by MARSHALL and ROGERS [this *Bulletin*, 1946, v. 43, 98], which is simple and rapid, and depends on laking of an acid dye. After extraction of paludrine from whole blood by a benzene-ethanol mixture, brom-thymol blue buffered at *p*H 7 is added. Complete combination takes place between the base and brom-thymol blue within 5 minutes, to give a product soluble in benzene, while excess of the dye remains in the aqueous phase. Instead of recovering the coupled dye from the benzene layer by shaking with alkali, the authors have, for simplicity, estimated the decrease in brom-thymol blue of the aqueous phase, after making it alkaline so as to develop the deep blue of the dissociated indicator. For measuring optical densities a photoelectric colorimeter is of value, and great care regarding cleanliness of apparatus and purity of reagents is recommended. The results of estimation of paludrine by the present method and that of the original authors were in good agreement. *J. D. Fulton.*

INDIAN MED. GAZ. 1945, Oct., v. 80, No. 10, 517. **Paludrine-M.4888.** [Editorial.]

In this Editorial note, attention is called to the paper by DAS GUPTA, LOWE and CHAKRAVARTI [this *Bulletin*, 1946, v. 43, 298] in which the compound M.3349, prepared by Imperial Chemical Industries, was referred to as Paludrine. The name Paludrine, however, is now applied exclusively to the later compound produced by the same firm and given the number M.4888. The two compounds differ very considerably in antimalarial activity and in toxicity.

The paper by Das Gupta *et al.* is probably the only publication in which M.3349 has been referred to as Paludrine, and the name Paludrine is now reserved for M.4888. *Charles Wilcocks.*

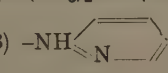
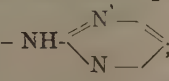
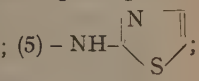
CURD, F. H. S. & ROSE, F. L. **The Discovery of Paludrine.** Reprinted from *Chemistry & Industry.* 1946, Feb. 16, No. 7, 75–7.

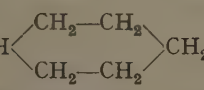
CURD, F. H. S. & ROSE, F. L.; DAVIS, M. I.; HULL, R., LOVELL, B. J., OPENSHAW, H. T., PAYMAN, L. C. & TODD, A. R.; RAISON, C. G.; OWEN, E. C.; TUEY, G. A. P.; RICHARDSON, D. N. **Synthetic Antimalarials. Part I. Some Derivatives of Arylamino and Aryl Substituted Pyrimidines** [CURD & ROSE]. *J. Chem. Soc.* 1946, May, 343–51. **Part II. 2-Substituted-Anilino-4-Aminoalkylamino-6-Methylpyrimidines** [CURD, DAVIS & ROSE]. *Ibid.* 351–7. **Part III. Some Derivatives of Mono- and Di-Alkylpyrimidines** [HULL, LOVELL, OPENSHAW, PAYMAN & TODD]. *Ibid.* 357–62. **Part IV. 2-Phenylguanidino-4-Aminoalkylamino-6-Methylpyrimidines** [CURD & ROSE]. *Ibid.* 362–6. **Part V. 2-Naphthylamino-4-Aminoalkylamino-6-Methylpyrimidines** [CURD, RAISON & ROSE]. *Ibid.* 366–70. **Part VI. Some 4-Arylamino-2-Aminoalkylamino-6-Methylpyrimidines** [CURD, DAVIS, OWEN, ROSE & TUEY]. *Ibid.* 370–78. **Part VII. 2-Arylamino-4-Dialkylaminoalkylaminopyrimidines. Variation of Substituents in the 5- and the 6-Position** [CURD, RICHARDSON & ROSE]. *Ibid.* 378–84.

MEAD, J. F., RAPPORT, M. M., SENEAR, A. E., MAYNARD, J. T. & KOEPFLI, J. B. **The Synthesis of Potential Antimalarials. Derivatives of Pantoyltaurine.** *J. Biol. Chem.* 1946, May, v. 163, No. 2, 465–73. [12 refs.]

The views of FILDES [*Lancet*, 1940, May 25, 955] that drugs could limit the growth of bacteria by competing with an essential metabolite of the bacterial cell have received confirmation by other workers. Certain sulphonamides are active against malaria parasites *in vivo*, perhaps by virtue of a similar effect. The present authors have applied the known facts to the synthesis of possible antimalarials. While there is little information at present available on the nature of essential metabolites of malaria parasites, the *in vitro* experiments of TRAGER [this *Bulletin*, 1943, v. 40, 675] indicated that pantothenic acid is a growth factor for *P. lophurae*. Several inhibitors of pantothenate metabolism by bacteria are known, and this fact suggested to the authors the desirability of testing them for antimalarial activity. For this purpose the preparation of optically active *d*—pantoyltaurine and derivatives has been carried out; in compounds 1–7, R varied as follows :—

$$HO\text{-}CH_2\text{-}C(CH_3)_2\text{-}CH(OH) - CO - NH - CH_2 - CH_2 - SO_2 - R.$$

R=(1) –ONa ; (2) $-NH_2$; (3)  ; (4)  ; (5)  ;

(6)  ; (7) $- NH - CH_2 - (CH_2)_{16} - CH_3$.

A report of the tests with these substances in avian malaria will be given later ; meanwhile it is stated that *d*-pantoyltaurylamide (2) has shown definite activity *in vivo*. *J. D. Fulton.*

SPECTOR, S., HAVILAND, J. W. & COGGESHALL, L. T. **The Ineffectiveness of Intensive Mapharsen, Bismuth and Carbarsone as Curative Drugs for Chronic Malaria.** *Amer. J. Trop. Med.* 1945, Nov., v. 25, No. 6, 463–7. [12 refs.]

The reasons that prompted the investigations here recorded were : the failure of all drugs hitherto tried to cure a large number of men suffering from chronic relapsing *P. vivax* malaria acquired in the Pacific war area, many of whom are entering the fourth year since infection ; the fact that malaria recurrences ceased in a group of eight syphilis patients who were receiving a 26-weeks' course of mapharsen therapy ; and the desire to decide beyond doubt whether therapeutically effective arsenic compounds, in maximum tolerated doses, could eliminate this type of malaria, and if not, to recommend strongly against their further use.

Four groups of patients were selected. Group I consisted of 15 men each of whom received, during an acute relapse of malaria, atebrin, 3.2 gm. over a seven-day period, and mapharsen 0.06 gm. intravenously, thrice weekly, till each had received 20 mgm. per kilogram of body weight. In Group II nine men were treated with mapharsen and bismuth ; seven of them were luetic. The bismuth subsalicylate was given intramuscularly. Seven men in this group received a minimum of 30 mgm. mapharsen per kilogram of body weight. In Group III, 48 patients received carbarsone, a pentavalent arsenical, by mouth. Ten men received carbarsone alone, 0.5 gm. twice daily for 7 days : the remaining 38 received atebrin in addition, 0.2 gm. twice daily for 7 days. Group IV, the control group, consisted of 94 patients who were treated with atebrin 0.2 gm. thrice daily for one day, then twice daily for 6 days, a total dose of 3 gm.

Within a month of the termination of treatment 7 of the 15 patients in Group I had both parasitic and clinical relapses ; by the end of the third month only three had remained parasitically and clinically free of malaria. In Group II only four had remained free of a parasitic or clinical relapse at the end of 3 months. In Group III carbarsone alone caused the disappearance of parasites from the blood in all but one case, but in four parasitaemia reappeared within 10 days ; in the 3-month period all had had parasitic relapses, but only 3 of the 10 had had clinical attacks. Among the 38 men who received carbarsone and atebrin, at the end of 3 months, there had been 24 parasitic relapses (63 per cent.) and 14 clinical relapses (37 per cent.). The control group of 94 patients, who had received atebrin alone, had in the same period 66 per cent. parasitic and 47 per cent. clinical relapses.

The conclusion is that arsenical preparations such as mapharsen and carbarsone are not indicated in the treatment of acute or chronic malaria.

Norman White.

GILLETTE, H. P. S. **The Progress of Malaria Control Measures in Trinidad and Tobago with special references to County St. David.** *Caribbean Med. J.* 1945, v. 7, Nos. 4, 5 & 6, 212–30.

In a malaria survey of Trinidad and Tobago [this *Bulletin*, 1944, v. 41, 445–7] 13 species of anophelines were found in Trinidad and three in Tobago. Since then another anopheline, *A. pessoai*, has been reported from Trinidad. *A. aquasalis* and *A. bellator* are the chief vectors of malaria in Trinidad, and *A. aquasalis* in Tobago. *A. aquasalis* readily enters human habitations ; the time of greatest invasion is from 6.30 to 8.0 p.m., a second less intense invasion occurring from 3 to 5 a.m. Its range of flight from breeding places may extend to three miles, and possibly to five miles at certain seasons of the year. For purposes of larval control, however, a zone of one mile radius round the area to be protected gives good results. After biting, *A. aquasalis* does not remain long in the house. Animal barriers are of value in maintaining a low *aquasalis* malaria rate. Among permanent control measures, good results have been obtained by the construction of a culvert with a beak, or sea head, designed to keep the mouths of small streams open, and by automatic flushing siphons. Paving ditches, and levelling and filling, have yielded excellent results in some places. The destruction of bromeliads in which *A. bellator* breeds, by spraying with a one-half per cent. solution of copper sulphate continues to give good results.

A detailed account is given of the control measures carried out, from 1941 to 1944, in the County of St. David, which forms the north-east corner of Trinidad. The success achieved is remarkable. St. David is now the least malarious county in the colony ; formerly it was the most malarious.

Norman White.

MAGOON, E. H. **Drainage for Health in the Caribbean Area.**

This book is reviewed on p. 877.

BOVARNICK, Marianna R., LINDSAY, Ann & HELLERMAN, L. **Metabolism of the Malarial Parasite, with reference particularly to the Action of Antimalarial Agents. I. Preparation and Properties of *Plasmodium lophurae* separated from the Red Cells of Duck Blood by means of Saponin.** *J. Biol. Chem.* 1946, May, v. 163, No. 2, 523–33. [21 refs.]

These respiration studies with *P. lophurae* were undertaken to obtain information on the mode of action of antimalarials. Previous studies by others,

on similar lines and with various species of malarial parasites, had so far failed to elucidate the mechanism of inhibition of respiration by drugs. In order to eliminate the influence on metabolism of the red cell, the parasites were freed from the latter by a modification of the saponin method of CHRISTOPHERS & FULTON [this *Bulletin*, 1940, v. 37, 190]. The present authors indicate that the factors of chief importance in this method are the concentration of saponin used and the temperature at which parasites are incubated with this substance. Respiration measurements showed that the oxygen uptake of erythrocyte-free parasites was sometimes 70 per cent. of that of the original parasitized cells, but varied more widely under different conditions of storage and experimental temperatures than the latter. This comparative instability of separated parasites could not be diminished by any treatment. The partial loss of respiratory activity was attributed to destruction of the duck red cells, which themselves respire actively and lose their activity through the action of saponin. The reciprocal action of the metabolic activities on one another of red cell and parasite host must also be considered. Special buffer solutions were used in respiration measurements and for washing red cells, the glucose usually present in the latter being omitted when other substrates were being studied.

The rate of oxygen uptake by intact parasitized cells varied with the stage of development of the parasite, as shown by other workers [this *Bulletin*, 1942, v. 39, 397 and 742 ; 1943, v. 40, 674 ; 1945, v. 42, 448]. With glucose as substrate, the R.Q. of the separated parasites varied between 0·7 and 1·0. Only when lactate or pyruvate was used as substrate was their oxygen consumption similar to that observed when glucose was used. The inhibition of respiration by cyanide was complete, but was less marked when azide was used. The inhibition could be counteracted to some extent by cresyl blue and other reversible dyes, the former by itself inhibiting normal respiration to some degree. This increase in respiratory activity brought about by cresyl blue was believed to be due to its action on the red cell. An investigation of the inhibition of oxygen uptake by these separated parasites, through the action of quinine or atebrin in presence of various substrates, showed that it only occurred to any extent at the relatively high concentration of 0·001 M in each case, and varied but little with the nature of the substrate. Cyanide-cresyl blue respiration was unaffected by these two drugs. *J. D. Fulton.*

BOVARNICK, Marianna R., LINDSAY, Ann & HELLERMAN, L. **Metabolism of the Malarial Parasite, with reference particularly to the Action of Antimalarial Agents. II. Atabrine (Quinacrine) Inhibition of Glucose Oxidation in Parasites initially depleted of Substrate. Reversal by Adenylic Acid.** *J. Biol. Chem.* 1946, May, v. 163, No. 2, 535–51. [21 refs.]

In Part I above, the authors noted that a relatively high concentration (0·001 M) of atebrin (quinacrine, mepacrine) was required to cause marked inhibition of oxygen consumption by *P. lophurae*. Inhibition did occur, however, at much lower concentrations in the case of parasites previously depleted of substrate, in which case there was a well defined lag period before the oxidation of added glucose began, which was reduced when lactate, pyruvate, fumarate or succinate were used as substrates. The measurements of glucose utilized and oxygen consumed, during this period were in agreement. The nature of this inhibition by atebrin has now been investigated.

Erythrocyte-free parasites were obtained and depleted of oxidizable substrates by washing and shaking for a period of 100 minutes at 37°C. in suitable buffer medium. The parasites apparently suffered damage proportional to the length of the substrate-free period. It was found that the induction period, before oxidation of added glucose begins, could be reduced by the addition of

certain other substrates during the period of depletion, or along with glucose at the end of that period. The inhibition of oxygen uptake by atebrin in substrate-depleted cells was most marked when glucose was the substrate added and caused an 80–90 per cent. inhibition of recovery, in contrast to a 20 per cent. inhibition in parasites not previously depleted of glucose. The marked effect on inhibition could be partially prevented by adenosine triphosphate (ATP) and adenylic acid (adenosine-5-phosphate), as well as by succinate and fumarate. These agents did not, however, appear to prevent cell damage. The inhibitory effect of atebrin under these conditions varied to some extent with the sample of blood used, and may have been due to the removal of the free drug by solid constituents of the suspension. When washed parasitized cells were used which could not be wholly depleted of substrate like the separated parasites, a similar sensitivity to atebrin was not apparent. A number of other drugs, including quinine and plasmoquine, behaved like atebrin at low concentrations, in preventing recovery of respiration in substrate-depleted cells. The specificity of action of adenylic acid in antagonizing the actions of atebrin led to an examination of phosphorus exchanges in cells and medium. It is probable that ATP and adenylic acid exert their effect in the speeding up of glucose oxidation by aiding the phosphorylation of this substance. Owing possibly to its impermeability, 1–6 diphosphofructose was without effect on the parasites. [FULTON (this *Bulletin*, 1940, v. 37, 509) found that *P. knowlesi* was unable to oxidize hexose di- or mono-phosphate.] It is possible that the action of atebrin is due to interference with some phosphorylation reactions which are necessary before glucose can be utilized.

J. D. Fulton.

MARSHALL, E. K., Jr., LITCHFIELD, J. T., Jr. & WHITE, H. J. **The Antimalarial Action in Ducks of certain Sulfanilamide Derivatives.** *J. Pharm. & Exper. Therap.* 1946, Mar., v. 86, No. 3, 273–9.

It was previously shown by the authors [this *Bulletin*, 1943, v. 40, 223] that sulphonamides are active against *P. lophurae* infections in ducks when the blood concentration of these substances is maintained at a suitable level. Their action is antagonized by *p*-aminobenzoic acid. In the present investigation, and with similar methods, the previous observations have been extended. White Peking ducklings weighing about 100 gm. were infected with 100×10^6 red cells parasitized with *P. lophurae*, which produced a peak of parasitaemia on the 6th day. Similarly, 50×10^6 red cells infected with *P. cathemerium* gave a peak on the 4th-5th day. The drug was administered in the diet, and treatment, which was given over a period of 5–10 days, was started 24 hours before infection. The birds were kept in light and in darkness, alternately, for 6-hour periods. The percentage reduction in parasitized cells at the time of peak-infection in controls was used as a measure of drug activity. On account of the wide variations in the degree of parasitization of the experimental birds, the geometric mean of individual values was used for assessing the value for a group. Quinine was used as the standard drug and the ratio of its minimal effective dose (producing a significant reduction in parasitaemia) to that for other drugs served to measure their relative activity. On this basis an evaluation of slightly active drugs is possible.

By this test sulphadiazine was found to possess high activity, relative to quinine, in *P. lophurae* infections. The percentage of parasitized cells could not, however, be reduced below 1–2 per cent. (compared with a 70 per cent. infection in the controls at the peak period on the 6th day), whatever the dosage of sulphadiazine used. Quinine was much more effective in this respect, probably on account of its more rapid action, for the effect of the two

drugs was similar when the peak of infection occurred on the 10th day, and a graded response relative to dosage was then obtained. By using *P. cathemerium* infections in the same hosts, a marked difference in species' susceptibility to sulphonamides was noted. Those in clinical use were not so effective against *P. cathemerium* as against *P. lophurae*. The activity of two halogen-substituted sulphonamides was about equal in both infections, and was considerably greater in *P. cathemerium* than that of the sulphonamides in common use. Judging by the fact that the halogen derivatives were antagonized to a much lesser degree than the other sulphonamides by *p*-aminobenzoic acid, their mode of action may be different. *J. D. Fulton.*

MISSIROLI, A. Sullo sviluppo dei parassiti malarigeni. [**On the Development of Malaria Parasites.**] *Riv. di Parassit.* Rome. 1940, June, v. 4, No. 2, 69–78, 2 text figs. & 27 figs. on 3 pls. (2 coloured).

TRYPANOSOMIASIS.

BURTT, E. **Incubation of Tsetse Pupae: Increased Transmission-Rate of** *Trypanosoma rhodesiense* **in** *Glossina morsitans*. *Ann. Trop. Med. & Parasit.* 1946, Apr., v. 40, No. 1, 18–28, 3 figs. [18 refs.]

Most previous work on the transmissibility of *Trypanosoma rhodesiense* has stressed the fact that the vertebrate host and the parasite have important bearings on the frequency with which the tsetse vectors become infected. In this paper experiments are described which show that the temperature to which the pupae of tsetse flies are exposed may profoundly influence the infectibility of the flies by trypanosomes; this newly-discovered factor in the transmission of trypanosomes must be taken into consideration in regard to past and present work both in the field and the laboratory.

Pupae of *Glossina morsitans*, collected in the field, were hatched out in the laboratory, some after keeping at laboratory temperatures and others in an incubator at 30°C. (86°F.). [Unfortunately the author has not given the laboratory temperatures to which the pupae were exposed and it is to be hoped that he will do so, but they were evidently below the incubation temperature, as a comparatively large number of the experiments were made during the cooler season, from June to August.] The flies were removed from the incubator within 24 hours of emergence and thereafter kept, like the others, under normal laboratory conditions. The results are shown in tables and charts.

Of 21,068 flies which emerged from pupae kept at laboratory temperatures and were fed on animals—sheep, reedbuck, Thomson's gazelle, or monkey (*Cercopithecus* sp.)—infected with *T. rhodesiense*, 7,127 lived long enough for complete development of the trypanosomes in them, and 296 (4.2 per cent.) showed infection of the salivary glands; while of 9,335 flies which emerged from incubated pupae, 3,352 lived long enough for complete development of the trypanosomes and 408 (12.2 per cent.) showed infection of the salivary glands.

The infection rate of flies from incubated pupae varied according to whether they fed on infected sheep, reedbuck, gazelle or monkey, but the difference was more marked with monkeys and Thomson's gazelle than with reedbuck or sheep. The results were all based on isolation of infective flies since the modified dissection methods of Lloyd and Johnson [this *Bulletin*, 1934, v. 31, 215; 1937, v. 34, 113], used at first, was found to be unreliable.

Transmissibility seemed to be further raised if incubation of the pupae was prolonged. The time taken for the completion of the cycle of *T. rhodesiense* in the fly was significantly shorter in those from incubated pupae than in those from normal pupae.

In all the experiments (110) with batches of flies from incubated pupae, transmission resulted, though many were done in the cooler season, but failure resulted in many of the experiments made with batches of flies from pupae kept at laboratory temperatures. No difference in longevity was observed between the two groups of flies.

VANDERPLANK (unpublished) in 1943, working independently of the author, obtained similar results with *T. congolense* in both *G. morsitans* and *G. swynnertoni*.

A further question which arises from this work is whether cooling of the pupae would produce flies more resistant to infection with trypanosomes.

The practical importance of the results is discussed, particularly as it may influence the seasonal incidence of trypanosomiasis. *Kenneth Mellanby.*

BURTT, E. **The Sex Ratio of Infected Flies found in Transmission-Experiments with** *Glossina morsitans* **and** *Trypanosoma rhodesiense*. *Ann. Trop. Med. & Parasit.* 1946, Apr., v. 40, No. 1, 74–9. [15 refs.]

In these experiments at Tinde laboratory about twice as many male as female *Glossina morsitans* developed salivary gland infections; this was true whether the pupae from which the flies emerged had or had not been incubated [see above] and whether the infection was derived from sheep, reedbuck, gazelle or monkey. The male and female flies emerged in equal proportions from both incubated and unincubated pupae, but in both cases there was a considerably higher death rate among female than male flies throughout their maintenance in Bruce fly boxes, but not when, towards the end of the experiments, they were kept singly in bottles after having fed. Other workers have shown that both in the laboratory and in nature female flies tend to survive slightly better than male flies. It therefore appears possible that at Tinde a greater proportion of potentially susceptible (to infection) female flies were being weeded out by early death than males, and that this might be responsible for the difference in the rates of infection in males and females.

DUKE [this *Bulletin*, 1930, v. 27, 847] found in experiments with *G. palpalis* that approximately equal numbers of male and female flies developed salivary gland infections; female *G. palpalis* survived significantly better in his experiments than female *G. morsitans* did at Tinde and Burtt suggests that *G. palpalis* withstands mass confinement better than *G. morsitans*.

As the infection rate of tsetse flies is usually low, the proportion in which the sexes survive in experiments should approximate to that occurring in nature; as this was not the case at Tinde the question of the relative infectibility of the sexes remains unanswered and experiments with flies kept singly in bottles are needed. It is a question of practical importance both for the correct interpretation of experimental results and of what takes place in nature.

Kenneth Mellanby.

DE AZEVEDO, J. F., CAMBOURNAC, F. J. C. & PINTO, M. R. A doença do sono na Guiné em 1944 e observações sobre Ofídeos, Culicídeos e *Phlebotomus* da Colónia. [**Sleeping Sickness in (Portuguese) Guinea in 1944 and Observations on the Local Snakes, Culicines and** *Phlebotomus*.] *An. Inst. Med. Trop.* Lisbon. 1945, Dec., v. 2, 7–47, 21 figs. on 10 pls. & 3 folding maps. English summary (4 lines).

The information given in this article is so condensed that it might almost be designated in itself an abstract. In November, 1943, a Commission was set

up to investigate the prevalence of sleeping sickness in Portuguese Guinea and to devise methods of prevention, because, shortly before, several severe cases of the disease had been observed among Europeans. The Commission started its work on 3rd January, 1944, and returned on 23rd February, having spent 50 days in the Colony. The amount of work attempted and accomplished during this brief period is astounding. They examined the natives, domestic and wild animals, caught and dissected specimens of *Glossina*, investigated the clinical aspects of the disease and its influence on the general mortality; in this paper they discuss the outlook and prophylaxis as regards the European and the native, and report on a study of the snakes and insect fauna. As if this were not enough, they were also asked to undertake, in their stride as it were, and as matters of secondary interest, a study of the prevalence and extent of yellow fever, and to collect evidence on the endemicity of malaria in the country.

The natives were collected in 48 places, on an average about 200 in each; in all, 8,543 were examined; 397 of them had enlarged glands and were therefore suspected of trypanosomiasis, and 61 of the glands were positive on puncture. The authors collected 3,930 specimens of *Glossina* and dissected 1,103; the proboscis, salivary glands or intestine of any found infected were inoculated into laboratory animals. Ninety-five per cent. (3,720 of the 3,930 collected) were *G. palpalis*, 146 (3·7 per cent.) were *G. submorsitans*, and the remainder, 64, were *G. longipalpis*. Only 0·8 per cent. of the 1,103 dissected showed infection "by polymorphic trypanosomes of the *T. gambiense* group" [salivary glands were infected in 6 (0·54 per cent.)]. No domestic animals, horses, cattle or sheep, were found to harbour trypanosomes infective for man. A gazelle was found with "a trypanosome of the *T. gambiense* group."

The effect of infection with trypanosomes on the general mortality is said to be slight, and the authors think that the strain of *T. gambiense* is one of low pathogenicity, and is peculiar to the district. Individuals might be found heavily infected, but nevertheless show practically no clinical signs. But, though the course of disease is long and apparently mild, fatal cases do occur. Comparing the present findings with those of Professor SEQUEIRA in 1932, they conclude that the disease has undoubtedly increased and spread. Until the reason for this extension is known, it is difficult, in fact not possible, to foretell the future in this respect. Prophylaxis consists in avoiding the fly-belts as far as possible, in travelling in the early morning or after dark, when the *Glossina* is less active, and in the preventive use of Bayer 205 for those who have to enter the infected zones. It would, they suggest, be well to set up a permanent mission to study and deal with the disease in Portuguese Guinea.

During their sleeping-sickness work, 10 species of snakes were caught; one was a python, seven were Aglyphae or Opisthoglyphae and so non-poisonous, two Viperidae were poisonous, *Causus rhombeatus* and *Bitis arietans*. The collecting of diptera was not included in the Commission's terms of reference, but, say the authors, they did not lose the opportunity of examining them. Among their catches were *A. gambiae*, *A. coustani* var. *tenebrosus*, a *Culex* "which could transmit filaria to man and dogs and certain protozoa, parasitic in birds," and two species of *Phlebotomus*, namely, *P. signatipennis* and *P. fallax*.

H. Harold Scott.

DE AZEVEDO, J. F., CAMBOURNAC, F. J. C. & PINTO, M. R. Sobre a infestação por tripanosomas das Glossinas da Guiné. [**Infestation of *Glossina* by Trypanosomes in Spanish Guinea.**] *An. Inst. Med. Trop.* Lisbon. 1945, Dec., v. 2, **49–66, 3 figs. English summary.**

DEWEY, H. M. & WORMALL, A. **Studies on Suramin (Antrypol : Bayer 205). 5. The Combination of the Drug with the Plasma and other Proteins.** *Biochem. J.* 1946, v. 40, No. 1, 119–24, 1 fig. [10 refs.]

This paper describes a continuation of work previously reported in this *Bulletin*, 1939, v. 36, 668 ; 1940, v. 37, 19. In this earlier work it had been shown that much of the Suramin found in the serum is in combination with proteins. The methods used to estimate Suramin do not differentiate between unchanged Suramin and degradation products or other substances which produce aromatic amines when hydrolysed by acid. Suramin combines with proteins quickly (in a few minutes). Much of the Suramin bound to proteins of human serum remained bound even after long extraction with methanol or aqueous ethanol. The amount bound varied in different experiments, but in one a fully extracted preparation still contained 5 per cent. of Suramin (*i.e.*, 3·5 mol. Suramin per 1 mol. protein of mol. wt. 100,000). The original concentration of Suramin in these mixtures of serum and Suramin was 1–2 ml. Suramin solution (0·2—9·6 per cent.) in 20 ml. serum [*i.e.*, of the order of 0·01 to 1 per cent.]. In some experiments with gelatin and casein, from 70 to 90 per cent. of the Suramin originally present became bound to these substances, but appreciably less was fixed by the serum protein. When Suramin is hydrolysed by acid, the absorption of the degradation products by serum protein is much less than that of the original Suramin, and the absorbed material can easily be removed by extraction with methanol. When hydrolysed Suramin is injected intravenously into rabbits, almost all of it disappears from the blood in 6 hours ; when unchanged Suramin is injected, considerable amounts persist in the blood for 90 days. Unhydrolysed Suramin is retained in the tissues of treated rabbits for many days ; hydrolysed Suramin is not retained in this way.

[There is some evidence that Suramin also combines with trypanosomes, since trypanosomes which have been exposed to Suramin and then washed are no longer infective for animals, although they remain motile *in vitro* for over 24 hours at 37°C., see HAWKING, this *Bulletin*, 1939, v. 36, 742.] *F. Hawking.*

DIAS, E. Aceica de 254 casos de doença de Chagas comprovadas em Minas Gerais. [**Observations on 254 Cases of Chagas's Disease in Minas Gerais.**] *Brasil-Medico.* 1946, Feb. 2 & 9, v. 60, Nos. 5/6, 41–4.

These brief notes refer to 254 cases of Chagas's disease seen in the States of Minas Gerais up to 26th December, 1945. Of the total, 118 were males, 136 females ; 168 were whites, 40 were negroes and 46 half-castes. The ages of those infected are given, showing that no age is exempt : 33 were under 5 years, 50 between 6 and 10 years, 52 between 11 and 15, 27 between 16 and 20, 30 in the third decade, 26 and 20 in the fourth and fifth respectively ; 16 were over 50 years of age. The primary lesion was on an eyelid in 38 cases among 57 studied ; elsewhere on the head in 8 (ears, lips, etc.), on arm or leg in 10, and one on the chest. The month of infection is noted in 47, but this is of little value where the total is so small ; suffice it to say that from September to February the cases numbered 5, 6, 6, 6, 7 and 8 ; in March and May there were 3 each, in April, July and August one, in June none.

The diagnosis was made by xenodiagnosis in 168, by serological reactions (chiefly complement fixation, using a culture of the trypanosome as antigen) in 44, by blood examination in 40, and histologically post mortem in two.

There were 13 fatal cases among the total 254. Electrocardiographic tracings were made in 207 ; 110 were normal, 97 abnormal. A-V block in 42, first grade in 30, second grade in 3 and total in 9, of the right ramus in 33. As regards residence, 105 were living in the town of Bambui, 131 in the municipality

but outside the town, and 18 further afield. Details of the places of residence in the different suburbs, 95 cases in all, are given, but are of local interest only.

H. Harold Scott.

DIAS, E. & FERREIRA, L. B. Doença de chagas em São João Batista do Glória, Oéste de Minas Gerais. Estudo dos transmissores e breve relato de cinco casos. [**Chagas's Disease in São João Batista do Gloria, Minas Geraes : Study of the Vectors and a Short Account of Five Cases.**] *Brasil-Medico.* 1946, Mar. 2 & 9, v. 60, Nos. 11, 12 & 13, 83–5. [11 refs.]

TORREALBA, F. J. Investigaciones sobre enfermedad de Chagas en el Estado Guárico-Venezuela. [**Study of Chagas's Disease in Guárico State, Venezuela.**] *Gac. Med. de Caracas.* 1945, Sept.–Dec., v. 53, Nos. 18/24, 168–74, 2 figs.

Though other causes of myocardial mischief exist in the rural population, such as malaria, schistosomiasis, syphilis, ankylostomiasis and alcoholism, the commonest is infection by *T. cruzi.* The author quotes abundantly from the literature of the last 12 years instancing cases of sudden death from this cause, such as the young baseball player, apparently in excellent health, running to a base and dropping dead; another dying suddenly while working in a maize field. Prior to 1935 such deaths were usually ascribed to syphilitic myocarditis. Examination of persons perhaps showing no signs of disease clinically may reveal enlarged hearts, arrhythmia, extrasystoles, intermittency and bradycardia as low as 23 per minute. Cases are quoted in which four brothers were affected in this way, another family with three brothers and two uncles. It must not be thought that sudden and early death is invariable. A case is referred to where a patient showed heart-block and was proved by xenodiagnosis in 1939 to be infected, but still carries on his work, though with an intermittent and irregular pulse. Details are given of six patients in the rural district with signs of myocarditis tested by xenodiagnostic methods. Three of these gave positive results and one of the negative gave 3-plus Wassermann and Kahn reactions.

H. Harold Scott.

MAZZA, S. Sobre la pretendida relación de enfermedad de Chagas y bocio y cretinismo endémico. A propósito de profilaxia del bocio. [**On the Supposed Relationship between Chagas's Disease and Endemic Goitre and Cretinism. The Prophylaxis of Goitre.**] *Revista d. Circulo Medico de Mendoza.* 1945, Sept., Oct., Nov. & Dec., Nos. 69/70, 7 pp.

[This article rather stresses what is now well known, that infection with *T. cruzi* is not the cause of the thyroid conditions observed in districts where Chagas's disease also persists.] The author states that the idea of *T. cruzi* infection being the cause of endemic goitre and cretinism ought now to be dropped; that there is practically nothing to support it. He then quotes various workers, CARINI, PEREIRA, COUTO, SERPA, BERCOVITZ, GONZALÉZ, FLORIANI and others, who have promulgated the error. Professor Mazza then speaks of one case, a child of 7 months dying after a period of marasmus from syphilis and infected with *T. cruzi,* in whom leishmanial forms of the parasite were found in all the organs and tissues, the thyroid among them. Since then, among 1,200 cases of Chagas's disease, the authors and his co-workers have not seen a single case of goitre consequent on *T. cruzi* infection.

H. Harold Scott.

LEISHMANIASIS.

ARCHETTI, I. Distribuzione e diffusione delle leishmaniosi nell'Africa Orientale Italiana. [**Distribution and Spread of Leishmaniasis in Italian East Africa.**] *Riv. di Biol. Colon.* Rome. 1940, Dec., v. 3, No. 6, 401–18, 1 map. [Numerous refs.]

NÁJERA, L. Observaciones sobre la ecología de los Phlebotomos en su fase larvaria principalmente. [**Observations on the Ecology of Phlebotomus, principally on Larvae.**] Reprinted from *Rev. Ibérica de Parasitologia.* 1946, Jan.–Apr., v. 6, 139–58, 19 figs. [29 refs.]

Reviewing general information on the food materials of the larvae of *Phlebotomus* spp. the author emphasizes particularly the observations of PARROT [see this *Bulletin*, 1933, v. 30, 308] and his co-workers that the larvae of some species will feed in captivity on the dried leaves of various trees. Such species include *P. papatasi*, *P. perniciosus*, *P. langeroni* var. *longicuspis*, *P. ariasi*, *P. sergenti*, *P. parroti* and, of Central African species, *P. schwetzi*. He considers this "phytophagy" a true biological character and points out that it is of considerable interest in explaining the general limitation of *Phlebotomus* to rural and suburban districts.

In laboratory cultures the author found that larvae eat filter paper with voracity when it is impregnated with liquids carrying nutritive organic substances in solution. His breeding technique was as follows :—

Females, caught in bedrooms, with fresh or partially digested blood meals, were put up in glass tubes of 5 cm. length and 2 cm. diameter. The bottoms of the tubes were lightly packed with cotton wool separated from the rest of the tube by filter paper disks cut accurately to fit the lumen and pushed down in contact with the wool, which was soaked in water. The mouths of the tubes were closed by a double layer of gauze and all the tubes were stacked vertically in petri dishes in a chamber of nearly 100 per cent. relative humidity. Eggs were laid on the filter paper, some on the wall of the tube, and were easy to examine and count with only low magnifications. About 70 per cent. of females oviposited and 20 per cent. deposited all the eggs contained in their ovaries. After oviposition the females usually died. Rearing of the hatched larvae was carried out in small unglazed baked-clay pots containing a layer of paste made from guineapig faeces over a layer of plaster. They were sunk in wet sand in a closed humid chamber.

Left after hatching in the tubes, the larvae developed to the second, sometimes the third, instar, and migrated downwards into the cotton wool, but they did not attack the filter paper. They did, however, attack the filter paper when it was put in the pots with the nutritive medium. Apparently, therefore, the cellulose of the paper is only eaten when it is impregnated with nutritive liquids. This behaviour has so far been observed only in *P. papatasi* and *P. perniciosus*.

The author discusses these phenomena of "phytophagy" and "papyrophagy" in relation to the pre- and post-war distribution of *Phlebotomus* in Madrid. Before the war they were confined to the periphery of the city and the vicinities of parks and gardens. Since 1940 they have increased and are abundant in other localities in the middle of the city. Although to superficial observation there is little alteration of the city from its pre-war condition, there are scattered throughout it many bombed sites which have not been rebuilt. Such sites are often unwalled and are used frequently as rubbish dumps or public latrines. A selection of photographs and a list of such sites are given, but the city was not examined systematically. Between 1942 and

1944, 148 soil samples from 33 sites were examined and 14 were found to contain *Phlebotomus* larvae. Almost all the positive findings were made in the months June to September. He points out the danger of the introduction of infantile kala azar into cities under these conditions, and recommends that bombed sites should be enclosed, and all organic débris therein destroyed.

W. H. R. Lumsden.

SEN GUPTA, P. C. & CHAKRAVARTY, N. K. **Penicillin in Cancrum Oris complicating Kala-Azar.** *Indian Med. Gaz.* 1945, Nov., v. 80, No. 11, 542–5, 2 figs. on pl.

It is well known that cancrum oris is one of the most fatal complications of kala azar, giving a mortality rate of at least 50 per cent. in spite of vigorous treatment with sulphonamides and pentnucleotide in addition to specific treatment for the leishmania infection. This unsatisfactory result has led the authors to test the effect of penicillin, and in this paper they report on the treatment of six cases—five in children, 2 to 10 years of age, and one in an adult. Penicillin was administered intramuscularly or intravenously every three hours for about a week, in doses of 10,000 units, while local applications of penicillin solution containing 500 units per cc. were made for three weeks. In one case penicillin was administered as a lozenge. In addition, specific treatment with pentavalent antimonials was carried out, while general supportive measures were undertaken. Under the penicillin treatment the necrotic process was quite unlike that seen in the cases that recovered in previous years. It was rapidly checked and did not continue to extend, while separation of sloughs occurred in all but one of the cases in 72 hours. All the patients recovered, and the end results, as regards scarring and deformity, were fairly satisfactory. In one or two of the cases the course of penicillin was repeated to expedite healing. It is concluded that the system of treatment adopted in the cases described is likely to meet with better success than the treatments which were previously adopted.

C. M. Wenyon.

CHAKRAVARTY, K. C. **The Treatment of Kala-Azar with Sodium Antimony Gluconate (Stibatin). Further Observations on the Treatment of Thirty-Two Cases.** *Indian Med. Gaz.* 1945, Oct., v. 80, No. 10, 507–11, 8 charts. [10 refs.]

In an earlier paper [this *Bulletin*, 1945, v. 42, 17] the author with BURKE reported upon the treatment of 21 cases of kala azar with sodium antimony gluconate or antimony-v-hexonate (stibatin of Glaxo Laboratories). In all these cases there was immediate clinical cure, but the follow-up was too short to justify any statement as to permanency of cure. The author of the present paper has followed up these 21 cases for six months ; 18 had remained quite healthy and can be considered cured, while 3 had relapsed. He also reports on the treatment of 32 other cases of kala azar in patients varying in age from under 10 to over 40. In children under 15 the total quantity administered was ten times the age in cc. or 1 cc. for each year of age multiplied by 10. For older patients the standard total dose is 1·5 cc. (or 30 mgm. of the antimony compound) for each pound of body weight, divided into 10 daily doses. In patients of such high weight that the total dose works out at over 200 cc. the number of injections may be increased. The drug is remarkably non-toxic, for in the cases treated there was an immediate reaction of palpitation in only one case, while in two cases albuminuria developed after four and seven injections. This albuminuria disappeared when the course was interrupted and it did not recur when treatment was resumed. The 32 cases were followed up

for six months, when it was found that only two had relapsed. The author concludes that the drug is specific in the treatment of kala azar, and on account of its low toxicity and ease of administration, owing to its being supplied in solution ready for injection, it is specially useful when mass treatment is required. *C. M. Wenyon.*

SEN GUPTA, P. C. & CHAKRAVARTY, N. K. **The Treatment of Kala-Azar with Sodium Antimony-v-Gluconate : Preliminary Observations.** *Indian Med. Gaz.* 1945, Nov., v. 80, No. 11, 560–64. [18 refs.]

In this paper the authors report on the treatment of 50 cases of kala azar in India, with sodium antimony gluconate in doses higher than those previously employed. The procedure adopted was to give daily intramuscular injection, for 10 to 12 days, of 15 to 20 cc. in the case of adults, or 6 to 15 cc. in the case of children. It was found that there was little irritation, the patient being able to walk home within 15 to 20 minutes after the injection. An analysis of the actual doses employed in the 50 cases gave a total dosage as follows : Children 3·7 cc., adolescents 2·7 cc., adults 2·1 cc. per pound of body weight. In seven patients the course had to be repeated. The immediate result of this treatment was very satisfactory as there was a clinical cure in 48 of the 50 cases. One of the failures was a case which proved resistant to all treatments, and the other was in a case complicated by agranulocytosis.

In addition to the cases of kala azar, two of post-kala azar dermal leishmaniasis in adults were treated by two courses of 10 or 11 injections at a week's interval. In both there was early and marked improvement.

All the cases treated are being followed up to determine if relapses do or do not occur. *C. M. Wenyon.*

CAMPOS, J. A. Intradermo-reação de Montenegro precoce. [**Accelerated Montenegro Reaction.**] *Arquivos de Hig. e Saúde Pública.* São Paulo. 1945, Mar., v. 10, No. 23, 43–6. English summary (9 lines).

After the intracutaneous injection of leishmania antigen in the application of the Montenegro test for cutaneous leishmaniasis, an anaemic swelling is at first produced which later, in positive cases, becomes a red papule. In a varying number of cases the reaction is indefinite. The authors have tested in a series of eleven cases the effect of cupping the initial swelling for 3 to 17 minutes. The result has been the earlier development of the positive reaction, which increases in intensity, while the indefinite reactions about which there may have been doubts become definitely positive. Completely negative cases are uninfluenced. *C. M. Wenyon.*

FEVERS OF THE TYPHUS GROUP.

CRAIGIE, J. **Application and Control of Ethyl-Ether-Water Interface Effects to the Separation of Rickettsiae from Yolk Sac Suspensions.** *Canadian J. Res.* Sect. E. Med. Sci. 1945, June, v. 23, No. 3, 104–14, 4 figs. [15 refs.]

This paper consists of two parts ; the first, which deals with the use of ethyl-ether in the purification of rickettsial suspensions made from infected yolk sacs, was issued as a confidential document in February, 1942 ; the second is a supplementary note, submitted for publication in January, 1945.

Two methods of purifying the triturated yolk-sac suspensions by ether are described ; " Method A " is stated in the supplementary note to remain the

method of choice for the small-scale preparation of pure suspensions of rickettsiae for use in serological investigations, whereas "Method B," which was formerly used in the preparation of vaccines, is said to have been replaced later by a method of processing crude yolk-sac rickettsial suspensions at *p*H 7.0.

In Method A the triturated suspension is centrifuged; the total sediment is suspended in saline buffered with phosphate at *p*H 7.0, and then emulsified with ethyl ether; the rickettsiae are recovered from the aqueous fraction that separates as the unstable emulsion breaks down.

In Method B, preliminary centrifugation is omitted; the separation of the aqueous fraction is controlled by the addition of acetate buffer to the crude triturated yolk-sac suspension, and there is a maximum yield of rickettsiae, which are afterwards treated with ethyl ether.

The principles involved, and the somewhat complicated technique employed in both methods, are described, but they cannot usefully be summarized.

The use of ethyl ether in the purification of suspensions of viruses and certain bacteria is discussed in the supplementary note; the ether is said to have three useful properties; it acts as a bactericidal agent, a lipoid solvent, and a remover of tissue impurities from virus suspensions.

John W. D. Megaw.

BRUMPT, L. C. & MACLOUF, A. C. Un cas de typhus exanthématique à incubation prolongée et apparemment déclenché par un pneumothorax thérapeutique. [**A Case of Exanthematic Typhus with Prolonged Incubation, and apparently Precipitated by an Artificial-Pneumothorax Operation.**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1946, Nos. 13/14, 205–8.

An attack of typhus fever occurred in a Polish patient who had previously been exposed for a long time to the risk of infection in Buchenwald Camp. Forty-one days before the onset he came into close contact with infected persons, and ten days later he was thoroughly disinfested with DDT after having discarded all his prison clothes, retaining only his mantle. He reached France 25 days before the onset; on arriving in Paris 22 days before the onset he burned all his clothes. Since his disinfestation 31 days before the onset he had not been exposed to any known risk of infection.

Artificial pneumothorax was induced seven days before the onset: the authors suggest that this may have been responsible for lighting up a latent infection of the reticulo-endothelial system. They consider it unlikely that infection was caused by inhalation of dried infected louse faeces. They mention that the maximum incubation period of louse-borne typhus is stated by DANIELOPOLU as 20 days, and by NICOLLE as 22 days, also that in murine typhus caused by living vaccine the incubation period may be as long as 25 days.

John W. D. Megaw.

PROC. ROY. SOC. MED. 1946, Feb., v. 39, No. 4, 165–8 (Sect. of Exper. Med. & Therap., 15–18). **Discussion on D.D.T.** [CAMERON, G. R.; CHALKE, H. D.; HILL, K. R.; CASE, R. A. M.; HELLIER, F. F.; HACKETT, C. J.; CHESTERMAN, C. C.]

CHALKE describes the conditions in Naples in the autumn of 1943 which led to an outbreak of typhus in November. During the last five weeks of that year the weekly numbers of cases were 36, 22, 45, 36 and 138. In 1944, up to 9th January, the incidence increased to 340 a week, then dropped dramatically to half this number, remained stationary for three weeks, after which it fell to 40 early in February, then gradually declined, there being a total of 1,600 cases.

The main preventive measure applied in the early part of the epidemic was an intensive search for cases and the treatment of all contacts with insecticide

applied in powder form by means of mechanical blowers. Up to the end of 1943 only about 10 per cent. of the dustings were done with DDT, the remainder being done with British or American preparations "AL 63" and "MYL," neither of which then contained DDT. From January 1 all dusting was done with 10 per cent. DDT in talc, and apparently at about the same time the mass dusting of large numbers of people replaced the dusting of known contacts. Chalke concludes that, taking into account the incubation period and the fact that few cases were notified before the fourth or fifth day, the initial control of the epidemic was brought about as a result of intensive case searching and the ringing of contacts with barriers of insecticide at a time when DDT was used only to a very limited extent. The epidemic, checked in this way, was finally ended by the large scale use of DDT.

Chalke also describes the method of use of DDT solutions in the destruction of adult anopheline mosquitoes in Italy in 1944.

HELLIER, describing conditions in Northern Europe, mentions a dermatitis associated with purpura amongst soldiers wearing shirts impregnated with DDT, and concludes that it was not due to DDT as such but to some associated factor. Presumably as a result of wearing treated shirts, lousiness was very rare amongst troops in France, Belgium and Holland, though their use did not seem to prevent the occurrence of scabies and pediculosis pubis, both of which became common in Belgium and Holland. *G. Macdonald.*

WOODWARD, T. E., PHILIP, C. B. & LORANGER, G. L. **Endemic Typhus in Manila, Philippine Islands. Report of Cases and Identification of the Murine Rickettsial Agent in Domestic Rats by Complement Fixation.** *J. Infect. Dis.* 1946, Mar.–Apr., v. 78, No. 2, 167–72, 1 fig. [10 refs.]

A detailed description is given of an attack of typhus fever in an American soldier, which occurred near Manila. *Proteus OX*19 was agglutinated at a titre of 1–2,560 ; the reaction with *Pr. OXK* was negative. The murine complement-fixation titre rose to 1–384 ; the epidemic titre was 1–6.

Two other cases were seen in the Manila area, and one in Mindanao ; though these were not closely studied, the serological reactions were of the same type.

Sera of 100 rats (89 of which were *Rattus norvegicus*), caught in Manila, were tested by murine complement-fixation reactions ; 18 were positive at titres ranging from 1–12 to 1–192. Only one of the rats reacted with *Proteus OX*19, at a titre of 1–80 ; ten reacted with *Pr. OXK*, but at low titres of 1–20 or 1–40.

Xenopsylla cheopis in limited numbers, and the mite, *Neoschöngastica indica*, in large numbers, were found on the rats.

Suspensions of the brains of two rats, and of the mites from another rat, were inoculated into guineapigs, with negative results ; these three rats had given positive reactions with the complement-fixation test. A guineapig was inoculated with blood from one of the patients, also with negative results.

John W. D. Megaw.

STUART, B. M. & PULLEN, R. L. **Endemic (Murine) Typhus Fever : Clinical Observations of 180 Cases.** *Ann. Intern. Med.* 1945, Oct., v. 23, No. 4, 520–36, 5 figs. [32 refs.]

During the 16 years, 1929–1944, 180 cases of endemic (murine) typhus were seen in a hospital in New Orleans. Only 21 of the cases occurred during the first ten years of the period ; in 1939 there were 16 cases, and in the successive five years the figures were :—19, 44, 14, 34, and 32. The authors believe that even when allowance is made for better diagnosis there was a real increase in the prevalence of the disease.

The disease was most prevalent in summer and early autumn ; only two cases occurred in the month of March ; then the incidence steadily increased, reaching its peak in August, in which 49 cases occurred ; during the five months June to October there were 128 cases, the remaining 52 cases were distributed among the other seven months of the year.

The average age of the patients was 34·6 years ; there were no deaths.

A macular rash was seen in 81·4 per cent. of the 129 white patients, and in 19·6 per cent. of the negro patients ; it extended to the face in three cases and to the palms in two.

The clinical features and Weil-Felix responses as described do not appear to differ in any important respect from those commonly observed in louse-borne typhus of corresponding severity.

The leucocyte picture was " none too characteristic," but there was usually a slight degree of leucopenia during the first week, and the average total count increased progressively from the fourth day, reaching a maximum of 11,000 per cmm. by the 15th day. Biopsy of the macular lesions was found helpful in diagnosis ; excised macules were fixed in Regaud's fluid and stained by the Giemsa method.

Although most of the patients were admitted after more than one week's illness, the presumptive diagnosis on admission was usually wrong ; it was typhus fever in only one-fourth of the cases. *John W. D. Megaw.*

MORALES, F. H. **Report of a Case of Typhus Fever.** *Bol. Asoc. Med. de Puerto Rico.* 1946, Feb., v. 38, No. 2, 68–9.

The author describes an interesting case of typhus fever (presumably of murine type) which occurred in Porto Rico in July 1945.

The patient had been vaccinated with a Wilmington murine strain of yolk-sac vaccine about four months previously. On July 3 he noticed a purulent discharge from one ear. On July 7 he was bitten by a guineapig suffering from an acute febrile and orchitic reaction after inoculation with typhus rickettsiae. On July 12 he was put on a course of penicillin injections for the staphylococcal infection of the ear ; the treatment was continued till July 22, by which date he had received nearly two million units of the drug. On July 20 he began to suffer from a mild attack of typhus fever which lasted 10 days. The Weil-Felix (*OX*19) reaction was positive in rising titre, which reached 1–3,200 by the 10th day.

The attack was attributed probably to the bite of the guineapig ; its mildness was thought to have been due to previous inoculation, or the penicillin treatment, or both combined. *John W. D. Megaw.*

DINGLEDINE, Mary J., WILLIS, Carolyn & HARRELL, G. T. **High Protein Diets in Therapy of Rocky Mountain Spotted Fever.** *J. Amer. Dietetic Ass.* 1946, May, v. 22, No. 5, 389–91.

Eight children, suffering from Rocky Mountain spotted fever, were kept on a diet rich in protein, carbohydrate, and all the vitamins, but low in fats.

When the patients could not be persuaded to take a full standard diet by the mouth, gavage was employed.

Several children actually gained weight during the illness, and the authors believe that convalescence was shortened by the generous diet.

No details of the effects of the treatment on protein metabolism are given ; these are being reported elsewhere. *John W. D. Megaw.*

YELLOW FEVER.

LAGOS, NIGERIA. **Annual Report of the Yellow Fever Research Institute. 1945.** 110 typed pp., 12 photographs, 5 maps, 12 figs. & 1 folding chart.

The Annual Report of this Institute for 1944 was reviewed in this *Bulletin*, 1945, v. 42, 800. The Institute was reopened for full work towards the end of 1943, after an interval of almost 10 years during which it had practically been closed, and during 1944 most of the work done was preliminary to the projected full-scale activities which were envisaged for the future. During 1945 the staff was built up, and in the last quarter the Institute functioned with a full staff for the first time; new buildings were constructed, but it was not possible to erect permanent structures.

One of the first enquiries made was an investigation of the distribution of yellow fever in Nigeria; only one case had been found since 1942. Protection tests were carried out on blood from the people, especially children, from various parts of the country, and the results showed 16 per cent. of positive tests. Immune children were found relatively frequently in areas in which the disease has been reported during the last 10 years, but the most interesting discovery was that, according to this evidence, there had been a recent outbreak of appreciable proportions within sight of Lagos. Moreover, three monkeys shot in the vicinity all gave strongly positive tests. Lagos itself, however, appears to have escaped, and the explanation of this is not certain; it may be that the relatively low density of *Aëdes aegypti* would not permit an extensive outbreak, or that the strain of *Aëdes aegypti* present is poor in carrying power. The information, however, indicates repeated widespread yellow fever outbreaks among the Africans throughout Nigeria south of latitude 10° N. It is calculated that there must have been many thousands, if not several hundreds of thousands, of cases in the past 15 years, yet recognition of the disease in the Africans is exceptional. Part of the explanation, no doubt, is that the medical service is inevitably thinly spread over the country, but more important is the fact that in the African yellow fever tends to be a mild disease. This is not true of Europeans, and the absence of large outbreaks in Europeans must be attributed to preventive measures, of which vaccination is the chief. As a background to the human disease there lies the still almost unknown subject of yellow fever in monkeys; evidence has been collected which points to these animals as the reservoir, but the subject has not yet sufficiently been studied. Investigations are now being made.

The experimental work done at the Institute included a study of the susceptibility of mice of different ages to subcutaneous injection of yellow fever virus. In the course of this study it was found that there is marked change in the blood-brain barrier; this change can be detected at the 7th day of life, and develops with great rapidity to the 10th day. In other words, before the 7th day a relatively small dose of virus, given subcutaneously, will kill the mice; after the 10th day the dose must be many thousands of times greater to achieve the same result. This phenomenon is probably due to the fact that mice are born while still in a relatively embryonic state; it seems not to be true of guineapigs, which are more mature at birth. The practical outcome of this and similar work in South America is that for the mouse-protection test, animals less than 8 days old should be used, and small amounts of virus. In this way weakly positive sera, which with grosser tests would be missed, can be detected.

The susceptibility of mice to the yellow fever virus has been very thoroughly investigated. Two strains of mice are kept at the Institute, one from Lagos (originally from Hamburg) and the other from Entebbe (originally from Rio

de Janeiro). In each strain there exists a fraction which, for all practical purposes, is completely resistant to the virus ; in the Lagos strain about 7 per cent., and in the Entebbe strain about 1 per cent., of the mice appear to be refractory. These qualities of susceptibility or non-susceptibility appear to be genetic, and work has now been put in hand whereby, by selective breeding, it is hoped to rear a susceptible strain from the Entebbe strain. An interesting fact has been observed, namely, that mammary carcinoma develops very frequently in the Entebbe strain, but not in the Lagos strain.

On the basis of the finding of susceptible strains of mice, the argument is developed that the same phenomenon probably occurs in other wild animals in nature, and that certain strains of mosquitoes (for instance *Aëdes aegypti*) may not possess the faculty of transmission of the virus to the same extent as other strains. For instance, *Galago demidovii* (the smallest of the " bush-babies ") was found to be somewhat refractory to yellow fever virus, though the larger species, *G. senegalensis*, was found by Smithburn in East Africa to be highly susceptible. Investigations into the vector efficiency of varieties of *Aëdes aegypti* are being made, and " the evidence is becoming more conclusive that populations of the same taxonomic group may differ markedly in their response to virus and that these variations may exist in the same area at different times. Inevitably, epidemiology develops genetic facets for complete understanding." [This important subject of inherited characters has a very wide application, not only to the susceptibility of hosts to an infecting organism, but also probably to the infective power of different strains of the infecting organism. It is discussed in relation to trypanosomes by CORSON (this *Bulletin*, 1946, v. 43, 169–176), and the work of LURIE on susceptibility of in-bred strains of rabbits to the tubercle bacillus is also much to the point (see *Bulletin of Hygiene*, 1941, v. 16, 670 ; 1945, v. 20, 313). The development of similar enquiries may lead to extensive changes in the conceptions of epidemiology.]

Other laboratory investigations included the estimation of the effect of temperature on the virus-antibody reaction, tests of susceptibility of local guineapigs, the effect of defibrination and of sodium citrate on virus in blood (these are not deleterious to the virus), and the effect of variations in the time of injection of starch into the brain in relation to intraperitoneal injection of virus (simultaneous injection of each appears, on the whole, to be the best procedure).

It is well known that the development of a viscerotomy service is essential to the efficiency of a research and control scheme for yellow fever. The beginnings of such a service have now been made in Nigeria. Difficulties are expected, especially among the Mohammedans of the north, but elsewhere it seems to be quite possible that viscerotomy will be successfully carried out.

Some work was carried out on other diseases in which the suspicion was aroused that they may have been due to viruses other than that of yellow fever, but without definite result. An account is given of the distribution of yellow fever vaccine during the year. *Charles Wilcocks.*

HEATON, C. E. **Yellow Fever in New York City.** *Bull. Med. Library Ass.* 1946, Apr., v. 34, No. 2, 67–78. [36 refs.]

A historical account.

FREEMAN, G. **Epidemiology and Incubation Period of Jaundice following Yellow Fever Vaccination.** *Amer. J. Trop. Med.* 1946, Jan., v. 26, No. 1, 15–32, 8 figs. [14 refs.]

An epidemiological study of jaundice following yellow fever vaccinations was undertaken at Camp " Baker " in the south-eastern United States. About

half of the population of 18,000 was transient, moving in and out on a weekly schedule, while the other half was permanent and could be more clearly studied. The epidemic coincided in time and duration with the large general epidemic among American troops during 1942. Altogether, slightly more than 700 cases, or approximately 3.8 per cent. of the total average population at risk, were hospitalized with jaundice. The first six cases occurred sporadically between August, 1941 and February, 1942, and these patients had not been vaccinated. Three companies were inoculated on December 30th, 1941, and during the first week of January, 1942, and of these approximately 500 men, nine had jaundice during the last 3 weeks of March, or roughly 70–90 days later. The three companies were housed in nine barracks holding some 50 men each; no cases occurred in 7 of the barracks, 4 in one and 5 in another, a distribution very unlikely to occur by chance. The bulk of the population was vaccinated between February 23rd and March 9th, 1942, and the main epidemic was continuous from May to September, with its peak in the last week of June. The personnel first affected belonged to Company A of Regiment Z. Members of this Company had received either YFV lot M1 or M2 during the first week of March, while at the same time the rest of the regiment received M2; 13 cases occurred in Company A during May and the first week of June before any occurred in the remainder of the regiment, an event most unlikely to occur by chance. The spatial distribution was also odd, for of the 12 barracks in which Company A was housed, 9 had no cases, 1 had 1 case, 1 had 3 cases and 1 had 7. Examples from other units are given of these discrepant events both in space and time.

The average interval of time between vaccination and onset of epidemic jaundice was 12.3 weeks, but varied, between units, from 11 to 15 weeks. The incidence in units appeared to fall in defined waves with an interval of 2 to 4 weeks between their peaks and an average of 3.2 weeks.

It appears, therefore, that there were two factors interwoven in this epidemiological pattern, namely, YFV and the focal grouping of cases. The latter, the spatial and temporal grouping of cases of jaundice in certain barracks and units among troops having received common YFV at approximately the same time, points towards a communicable disease with an incubation period of 2–4 weeks rather than to one caused by "icterogenic" vaccine. A large increase in the attack rate on the unvaccinated population was also observed, and it is likely that all the cases of jaundice, whether they did or did not receive YFV, had a common aetiology. The YFV used on certain Army posts appears to have had the property of predisposing its recipients to the communicable disease referred to as jaundice and this property varied among the several lots of YFV.

[The evidence is set out graphically and the paper is a difficult one either to read or to abstract adequately.] *A. Bradford Hill.*

PLAGUE.

BHATNAGAR, S. S. & SHRIVASTAVA, D. L. **An Experimental Study on Cellular Immunity in *Pasteurella pestis* Infection.** *J. Hygiene.* 1946, May, v. 44, No. 5, 307–13, 3 coloured figs. on 1 pl. [20 refs.]

This study relates mainly to the leucocyte picture of the peripheral blood as an index of resistance or immunity. A supravital staining technique was

used with neutral red as the indicator stain. Janus green, the mitochondrial stain, which is ordinarily used along with neutral red, had to be omitted, as the combination of the stains was too toxic for cells in the presence of a bacterial infection. Total leucocyte counts and differential counts were also used. The two test animals were the highly immune Bombay rat and the highly susceptible inbred laboratory mouse. Immunization (passive) or protection was effected by injection of one of the three types of sera known as pure envelope, pure somatic and whole antiplague serum. Of the pure sera it is the envelope type alone which is protective, and this was confirmed by the cellular leucocyte response here investigated. Two types of leucocyte, or rather three, are distinguished, the polymorphonuclear (or microphage) and the macrophages (monocyte and clasmatocyte). Clasmatocytes are distinguished from monocytes by their much greater size, and were significantly absent during the tests of cellular response in relation to active immunity of susceptible mice. Here the polymorphonuclear leucocyte reacted vigorously at an early stage and it was this cell which " appeared to form the first and the last line of defence " of the susceptible inbred laboratory mouse ; its steady deterioration cytologically was an index of the downhill course of infection.

It was otherwise with the cellular response to the protective envelope serum, where the penetration and segregation in pattern of neutral red was a marked index of immunity. No protective value of polymorph leucocytosis could be demonstrated in either serum-treated or non-treated white mice. It was the detection of clasmatocytes in the peripheral blood that was found to be " an objective observation of great prognostic value," and this has to be coupled with observations on the monocytes. " The association of monocytes with passive protection was well marked ; their maintenance at high level connoted protection while a significant diminution in their number heralded a fatal termination." An increase or a decrease of neutral red vacuoles in monocytes or clasmatocytes was an indication of degree of functional digestive activity for living particulate material. It was this index which was found " both in the case of immunity and susceptibility " to show whether the struggle was developing in favour of host or parasite. The test should, therefore, as the authors contend, be valuable for immunological assessment of the value of plague-serum therapy and plague prophylaxis. *W. F. Harvey.*

Pozzo, Adolfo. **Peste de Oriente.**

This book is reviewed on p. 880.

BACILLARY DYSENTERY.

Brodie, J., Cook, R. P., Drysdale, Constance F. & McIntosh, D. G. **Treatment of Sonne III Bacillary Dysentery and Bacillary Dysentery (" Clinical ") with Phthalyl Sulphathiazole.** *Brit. Med. J.* 1946, June 22, 948–50. [10 refs.]

Forty-eight cases of Sonne III dysentery, and 40 cases of " clinical " dysentery (blood and mucus in the stools but no organism isolated), were treated with phthalyl sulphathiazole at King's Cross Hospital, Dundee, in the period from August 1944 to June 1945 ; the dosage is shown in Table 1.

TABLE I.

Dosage of Phthalyl Sulphathiazole.

Age in years	Grammes per day					Total in grammes
	1st	2nd	3rd	4th	5th	
0–2	3	1	1	1	1	7
2–5	5	2	2	2	2	13
5–12	10	3	3	3	3	22
Over 12	15	4	4	4	4	31

The results are compared with those obtained by JAMIESON, BRODIE and STIVEN [this *Bulletin*, 1944, v. 41, 754] who treated 100 cases with sulphaguanidine, 50 with saline aperients and 50 with chalk mixture ; this comparison is shown in Table III.

TABLE III.

Comparison of Treatments for Bacillary Dysentery.

Treatment	No. of cases		Average time in days required for "clinical cure"		Cases positive bacteriologically in convalescence			
					Sonne III		Total	
	Sonne III	Total	Sonne III	Total	No.	%	No.	%
Aperients	11	50	6·3	6·5	4	36·4	25	50
Chalk	18	50	7·6	6·0	11	61·1	26	52
Sulphaguanidine ...	10	100	4·7	5·0	4	40·0	30	30
Phthalyl sulphathiazole ...	48	—	8·73	—	10	20·8	—	—

The present results with phthalyl sulphathiazole agreed with those obtained with sulphapyridine by SWYER [this *Bulletin*, 1943, v. 40, 844] who found that the stools in treated cases remained abnormal for 9 days, compared with 20 days in control cases.

The amount of free phthalyl sulphathiazole in faeces, blood and urine was estimated and it was shown that a small amount had been absorbed from the alimentary canal.

"In vitro experiments showed that phthalyl sulphathiazole exerts a bacteriostatic effect against a number of intestinal organisms. A Flexner strain, a Sonne III organism and a strain of *B. coli* were completely inhibited in semi-solid and fluid media containing the drug."

The authors conclude that phthalyl sulphathiazole did not influence the clinical course of Sonne III dysentery but "reduced considerably the number of cases bacteriologically positive in convalescence." *J. F. Corson.*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS.

DORMER, B. A. **Pulmonary Amoebiasis.** *Proc. Transvaal Mine Med. Officers' Ass.* 1945, Nov., v. 25, No. 278, 113–27, 6 diagrams & 23 pls.

In Natal, S. Africa, acute amoebic dysentery and amoebic hepatitis are very rare in the well-fed Europeans, although 5 per cent. harbour *E. histolytica*; they are also very uncommon in the fairly well-fed Indian population; but they are very common in the Bantus, 17 per cent. of whom have been shown, on a single stool examination, to harbour the parasite (three times this number may therefore be assumed to be infected). The incidence of acute and of metastatic *E. histolytica* infections in the Bantus has risen steadily since the war, especially in the urban areas. Tuberculosis and amoebiasis show a strange parallelism in the Africans, who are poorly fed and live on a protein-deficient diet. The author postulates that a high carbohydrate (especially maize or rice) and low animal protein diet favours amoebic bowel infection; and that a reasonably high protein diet, with wheat as the staple carbohydrate, does not do so. The stools of the African are highly acid, indicating a bacterial, chemical, and physical state of the bowel favourable to amoebiasis; while those of the European are alkaline, and the conditions are unfavourable to the parasites. [No explanation is offered of the low incidence of amoebiasis and its manifestations in the, presumably, rice-eating Indian community.] Epidemic bacillary dysentery is rare in the Natal native, and this is due to the acid bowel medium, which does not favour the growth of the causative organisms.

Amoebiasis is common in the tropics as high relative humidity leads to longer survival of cysts outside the body, and the food habits of the people are conducive to its establishment in them. Infection rates on the coast are greater than inland, as inland the humidity is less and the temperature lower. The author considers that the provision of "adequate first-class protein" in the diet of the Bantus, and "the reduction of maize and rice products as the principal source of carbohydrate," with replacement by wheat would, with proper sanitation and education, control the situation. The treatment of the individual essentially consists of dietary rectification, with drug treatment as an ancillary where necessary. The author then goes on to a discussion of pulmonary amoebiasis, illustrating by drawings and X-ray photographs cases of direct extension of infection from the liver to the lung, and of embolic infection of the lung.

[The author's conclusion that diet, *per se*, plays a major part in the infection of the individual does not appear to have been substantiated elsewhere. In the Japanese prison camps amoebiasis was not unduly obtrusive, when sanitation could be attended to, in spite of the inadequate and almost exclusively rice diet. Furthermore, amoebiasis was very prevalent among well-fed troops living on a high protein diet, under the unavoidably insanitary, fly-ridden conditions obtaining for brief periods during active operations. Again, while high relative humidity may favour longevity of cysts outside the body, high temperatures do not do so, and cysts will not withstand ordinary drying, whatever the atmospheric humidity. Does not a more adequate explanation of the incidence of amoebiasis lie in the personal habits, housing, and sanitary standards obtaining among the various communities?]

A. R. D. Adams.

CHAUDHURI, R. N. & RAI CHAUDHURI, M. N. **Pulmonary Amoebiasis.** *Indian Med. Gaz.* 1946, Feb., v. 81, No. 2, 66–7, 3 figs. (1 on pl.)

Amoebiasis of the lung is much more common than is thought, but is often undetected, or is misdiagnosed as pulmonary tuberculosis. The authors review some of the few published reports of the clinical condition, and add to these

two further case reports from the Carmichael Hospital for Tropical Diseases, Calcutta. Both patients were Bengali women, aged 24 years. In the first case the X-ray appearances were suggestive of tuberculosis, but no bacilli were found; no *E. histolytica* were recovered from the sputum or stools ; and emetine injections cured the pain and physical signs in the right chest, the cough, fever and loss of condition for which the patient was admitted. In the second case *E. histolytica*, but no tubercle bacilli, were found in the sputum, and none in the stools ; on admission to hospital there were fever, cough, and blood-stained sputum, but no physical signs and, again, emetine injections proved specific. Both cases had some leucocytosis, that in the first being marked (23,500 per cmm.) and that in the second " slight." In each case there was initial aggravation of the symptoms on beginning emetine injections. *A. R. D. Adams.*

WITHERSPOON, F. G. **Exfoliative Dermatitis associated with Amebic Dysentery.** *Arch. Dermat. & Syph.* 1946, May, v. 53, No. 5, 506–7.

" A case of exfoliative dermatitis with an associated amoebic dysentery is described. On successful treatment of the amoebic infection great improvement in the dermatologic condition occurred. A search of the available literature has revealed no similar case."

CHAPIN, S. E. **Positive Urine Methylene Blue Test in Amebic Hepatitis.** *J. Amer. Med. Ass.* 1946, Apr. 20, v. 130, No. 16, 1071–2.

In a case of amoebic hepatitis in a young American Marine, the methylene blue test of the urine [see *Bulletin of Hygiene*, 1945, v. 20, 660] was strongly positive and the urine contained a considerable amount of bile. *Entamoeba histolytica* was present in the faeces in large numbers. Treatment with emetine, carbarsone, choline chloride, a high protein diet, and multivitamin tablets was followed by apparent cure in 3 weeks. The methylene blue test of the urine became negative on the 5th day after the beginning of treatment.

The authors recommend the test as directing attention to the liver in acute inflammations of that organ. *J. F. Corson.*

CHAUDHURI, R. N. & RAI CHAUDHURI, M. N. **A Case of " Amoeboma."** *Indian Med. Gaz.* 1946, Mar., v. 81, No. 3, 138–9, 3 figs. on pl.

HARGREAVES, W. H. **The Treatment of Amoebiasis with special reference to Chronic Amoebic Dysentery.** *Quart. J. Med.* 1946, Jan., v. 15, No. 57, 1–23. [85 refs.]

After a brief account of the distribution, epidemiology, and incidence of amoebic dysentery the author reviews in detail the drugs believed to exert some influence on the infection. Emetine is the most effective drug available, but, alone, it is not often curative. Emetine bismuth iodide is the most efficient basis for combined specific treatment, if it is given in a proper form as a powder in gelatin capsules, and *not* in pills or tablets. After stressing the importance of early diagnosis and efficient treatment, the author discusses the bewildering number of treatments variously advocated, and the criteria by which their efficacy has been judged. The variations in the claimed successes of various treatments by sundry authors may be attributable to variation in the standards adopted for assessment of cure. The pathology of the infection in the bowel and the symptomatology due to it receive attention at some

length, and the author then turns to the refractory cases of amoebic dysentery which arrived in the United Kingdom from the Far Eastern theatres of the late war. Questions of emetine-resistance, of variations in virulence of different strains of parasites, and of secondary bacterial infection superimposed on the amoebic infection are considered in detail. Hargreaves does not think there is any evidence of the development of emetine-fastness by *E. histolytica*; and the position in regard to variations in virulence of different strains of the parasite he thinks is far from clear. The available evidence points to differences in susceptibility of the patients, rather than to biological differences in the strains of organisms, as the cause of variations in severity of the manifestations resultant on the presence of the parasite.

Secondary bacterial infection plays an important part in determining the severity of the colitis and in preventing a satisfactory response to anti-amoebic treatment. Successful control of this secondary bacterial infection, with penicillin and succinyl sulphathiazole, results in markedly more effective action of the amoebicidal drugs, and it also may save life in grave cases of superadded bacillary colitis. Chronic cases of amoebic dysentery, previously labelled emetine-resistant, have been cleared of their infection by standard treatment with E.B.I. and chiniofon enemata, after a penicillin and sulphasuxidine course. Only occasionally has more than one course of the standard anti-amoebic treatment been necessary to obtain cure after the bacterial infection has been dealt with, although this latter may need more than one course of penicillin and sulphasuxidine to overcome it.

The indications for surgery in amoebiasis, and the use of the sigmoidoscope, are discussed; and the general management of the patient, and the author's standards of examination for cure, are detailed. That the difficulties in the diagnosis and treatment of amoebiasis were fully realized by the Germans is evident from the fact that they dropped propaganda leaflets containing advice to our troops on the methods of simulating the disease in its refractory form; a copy of one of these is given. *A. R. D. Adams.*

WANTOCH, H. G. Zur Frage der sogenannten nicht-pathogenen Amöben. [**So-called Non-pathogenic Amoebae.**] *Schweiz. med. Woch.* 1946, Mar. 30, v. 76, No. 13, 280–81.

The author, from his experiences in Shanghai, maintains that the so called non-pathogenic amoebae of the human intestine are far from being non-pathogenic for, in his experience, they are liable to cause various disturbances such as abdominal discomfort or pain, diarrhoea or constipation. In no case, however, is there real dysentery with blood and mucus in the stools as in the case of *E. histolytica* infections. In most of the cases quoted *E. coli* was the amoeba present, and when the infection was eradicated by yatren, acetarsol, carbarsone or other suitable remedies, the symptoms abated.

C. M. Wenyon.

RELAPSING FEVER AND OTHER SPIROCHAETOSES.

WILLIAMSON, J. & LOURIE, E. M. **Therapeutic Action of Different Penicillins on *Spirochaeta recurrentis* Infections in Mice.** *Brit. Med. J.* 1946, June 1, 828–9. [11 refs.]

The authors have compared the therapeutic action of three different preparations of penicillin:—(*a*) The partially purified product as issued for

parenteral injection ; (*b*) crystalline penicillin II ; (*c*) crystalline penicillin III—on relapsing fever infections in mice.

No significant differences were found between the actions of the partially purified preparations and crystalline penicillin II, but penicillin III was substantially less effective.

The present experiments suggest that it is becoming increasingly necessary to investigate the anti-spirochaetal properties of the by-products in the manufacture of penicillin. Since the more easily and more copiously produced forms of penicillin, such as penicillin II, are more active against infections of *Spirochaeta recurrentis*, it is suggested that they may also be more active against syphilis. This would be fortunate, if substantiated, since this disease requires such a high aggregate dosage. *E. Hindle.*

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. PUBLICATION No. 18. **A Symposium on Relapsing Fever in the Americas.**

This book is reviewed on p. 881.

NOBREGA, G. Um caso de sodóku [**A Case of Rat-Bite Fever.**] *Brasil-Medico.* 1946, Feb. 2 & 9, v. 60, Nos. 5/6, 35–6, 2 figs.

Up to April, 1939, Professor DA FONSECA had recorded 14 cases of sodoku in Brazil. Nevertheless, says the author, none of the standard text-books on tropical medicine contains any reference to the existence of this disease in Brazil [but STITT mentions South America in the geographical distribution]. The author consequently is anxious to place the present case on record.

The patient was a boy of 11 years and was bitten on the left hypothenar region on 23rd September, 1943. The wound bled slightly and was treated with mercurochrome. Four days later the wound became painful and there was a little discharge from it. Six days after the bite he had a bout of fever and the wound continued to be painful. It then healed and cicatrized, but during the next 3 weeks he had 5 paroxysms of fever, lasting for 48 to 72 hours. They were not ushered in with any rigor or shivering and there was no terminal sweating ; the only symptoms were the rise of temperature to 39.4°C., with headache and rapid pulse. The epitrochlear gland was swollen and slight enlargement of the axillary glands was observed. *Ascaris* and ankylostome ova were numerous in the faeces, but there was no eosinophilia (4 and 3 per cent. only on two occasions when the total leucocytes were 13,500 and 16,000 per cmm.) As the wound had healed no fluid could be obtained from it for examination ; gland puncture was refused, but 15 cc. of blood taken during a febrile paroxysm was inoculated into white rats (camondongos), and these animals 11 days later showed infection by *Spirillum minus.* *H. Harold Scott.*

LEPROSY.

SCHUJMAN, S. Criterio para otorgar el alta hospitalaria a los enfermos de lepra. [**Criteria for the Release of Leper Patients from Hospital.**] *Rev. Argentina Dermatosifilologia.* 1945, Dec., v. 29, No. 4, 249–52.

One gathers from the text of this article that the subject of discharge of lepers from hospital was posed as one for discussion at the Third Congress on Leprosy. The term " discharge " is regarded as being of three types : (1) Permission to leave hospital on the promise of continuing treatment and attending a dispensary ; (2) Conditional on coming up periodically for observation ;

(3) Definitive ; the patient ceasing treatment and severing all connexion with the Leprosy Department. The present contribution deals with the first of these. It is of epidemiological importance from the points of view of the patient, his relatives and associates.

Rules at present are far from uniform. In the Philippines it was the custom to let the patients go from hospital after being for 6 months " bacterially and clinically negative," but a large percentage were found to relapse, so the time was increased to one year. In Hawaii, patients were let out on parole after three negative examinations carried out at intervals of 3 months. At Carville, when a patient became negative he was passed on to a special section of the establishment where he was treated and under further control for two years, and if at the end of that time he was still negative he received his discharge. In São Paulo, they used to be released after being negative for a year, but so many were found to relapse that this period was doubled.

In the author's view the decision must depend on several grounds. It is of the utmost importance to note the condition on arrival, the type and extent of the disease. Notes on progress must be made frequently and discharge from hospital will depend on the clinical state on admission, the number of bacilli then present, and on the progress made, " clinically and bacterially and immunologically and on the treatment which has been adopted." With this proviso he suggests the following as guides :

(*a*) *Tuberculoid cases* with isolated lesions may be allowed to leave after being bacterially negative for 8 months. For those showing reactions the time should be prolonged to a year in those giving a definitely positive Mitsuda test and 1½ years in those giving a weak positive.

(*b*) In *lepromatous cases* we should be more cautious, according to the intensity of the process. Those of L1 type should be detained in hospital for two years after they become negative ; treatment should be continued during this time and frequent clinical and bacteriological examinations should be made, bimonthly for the first year and monthly for the second. For L2 and L3 patients the period should be at least three years and provocative measures should be tried, such as the giving of potassium iodide, sulphanilamides, tuberculin, etc., before a case is declared negative. *H. Harold Scott.*

CERBONI, E. A., PECORARO, V. & RODOLFO MERCAU, A. Bases para la reglamentación de las altas de los enfermos de lepra. [**Bases for Rules for Discharge of Lepers from Hospital.**] *Rev. Argentina Dermatosifilologia.* 1945, Dec., v. 29, No. 4, 253–6.

The rules or regulations proposed by the authors are based on those of São Paulo, adapted to the South American classification of cases of leprosy, and to the present-day ideas on its immunology. A brief sketch of what is done in other countries is given as a preliminary. [These have been noted in the preceding abstract and need not be repeated.] The rules are laid down for the three types mentioned by SCHUJMAN [see above.]

I. *Release from In-patient Treatment.*—(1) Within 30 days of admission the patient should be examined and classified in one of the following three categories : (*a*) Lepromatous ; (*b*) Non-characteristic, bacteriologically positive; (*c*) Tuberculoid, bacteriologically positive.

(2) When they become bacterially negative : Those of (*a*) should continue under observation for two years ; those of (*b*) who react negatively to immunobiological tests to be under observation for 12 months ; those positively reacting, for 6 months ; those, of (*c*) to be kept under observation for 6 months.

(3) During the period of observation they should undergo a clinical and bacteriological examination (the latter of the skin, the nasal mucosa and gland

juice obtained by puncture) every 3 months and a histo-pathological examination every 6 months.

(4) The above being satisfactory, an ophthalmological and laryngological examination should be made to exclude any active lesions in these sites.

(5) The patient is then sent, with his clinical history, before a medical board. In addition to the history of the case from the time of the patient's admission, information should be furnished regarding his intended place of residence, his means of living, and his immediate associates will be under supervision.

(6) A patient so discharged should subject himself for re-examination every 4 months for 2 years and bring a certificate from his doctor that he has been under his constant treatment.

The patient will now come under the category of those :—

II. *Conditionally discharged*, with permission to engage in certain occupations and to suspend treatment, with the doctor's consent. The following may come under this heading : Tuberculoid cases and the non-characteristic bacterially negative, which have had two years' treatment, whose lesions have retrogressed and who show no signs of activity.

Patients conditionally discharged are still under observation by the Board and should be examined every 6 months for 5 years, being treated or suspending treatment at the decision of the medical attendant.

III. *Definitive discharge.*—Those who have fulfilled the conditions of the previous group—who have been examined every 6 months for 5 years, have remained clinically free from symptoms and bacterially negative even after provocative tests, as by administration of potassium iodide and any other tests which the Board may require—will be eligible for final discharge.

H. Harold Scott.

FIOL, H. Altas a los enfermos de lepra. [**Discharge of Lepers from Hospital.**] *Rev. Argentina Dermatosifilologia.* 1945, Dec., v. 29, No. 4, 257–62. [10 refs.]

Some nations, the Japanese for example, believe leprosy to be incurable and therefore have no rules for discharge of patients. The author starts by stating the criteria of cure and calling for consideration of the following points : Absence of any clinical signs of activity, absence of lepra bacilli from the nasal mucosa, of active lesions of the skin, nerves or glands, and absence of signs by biopsy, by biological tests, and provocation tests (as the giving of potassium iodide) and Fernandez's test, the subcutaneous injection of lepromin.

The advantages of discharging patients are that the outlook of all is brightened, the morale of those remaining is raised by their realizing the possibility of their own discharge, inciting other patients to enter hospital in search of cure and reducing congestion of leper colonies. Its drawbacks are the need for keeping an eye on, and exercising control over, those liberated, watching for the first signs of relapse, indiscipline among the discharged, failure to attend for examination, changing residence and so on.

The author next gives figures, quoted from the literature, to illustrate the frequency of relapsing cases, and shows that the returns are very varied ; HAYASHI gives the rate as high as 50 per cent., DENNEY as low as 3 per cent. CAMPOS gives 17·4, but the figure depends much on the type of disease—lepromatous cases 5 per cent., mixed 38, maculo-anaesthetic 12·9 per cent. and so on.

Definitive discharge, he suggests, should not be absolute, but should be subject to annual revision. The rest of this article is taken up with what is done elsewhere, as at S. Paulo, and the criteria mentioned in the foregoing abstracts.

H. Harold Scott.

GARZÓN, R. & ARGÜELLO PITT, L. Conveniencia de unificar el criterio y la reglamentación de las altas en los enfermos de lepra. [**Convenience of Unifying the Rules for Discharge of Lepers from Hospital.**] *Rev. Argentina Dermatosifilologia.* 1945, Dec., v. 29, No. 4, 263–5.

This covers much the same ground as the preceding abstracts. The authors stress the fact that everything depends on the type of disease, the frequency of examination, the constant vigilance to discover the earliest signs of relapse, the provisional discharge with constant observation and frequent re-examination before the final free release is granted. *H. Harold Scott.*

ARGÜELLO PITT, L. & CONEJOS, M. La bacteriología de la lepra tuberculoide. [**Bacteriology of Tuberculoid Leprosy.**] *Rev. Argentina Dermatosifilologia.* 1945, Dec., v. 29, No. 4, 309–11.

In the Leprosy Congress at Cairo in 1938 the decision was reached that tuberculoid leprosy was not a "fundamental form," but merely a variety of the neural type. In the following year, however, at Brazil, the Congress decided that it *was* a "fundamental form" with characteristic histological changes. Epidemiologically, it differed from the lepromatous in not containing bacilli and so was practically non-contagious. Others have maintained that the lesions may, transitorily, contain bacilli, for days at a time, perhaps for months.

To determine whether these lesions were bacilliferous or not the authors have examined 78 cases. BICHELLI in 1940 found 84 positive among 466 cases (18 per cent.), FERNANDEZ in 1939 found 12 positive among 14, but all were in a "reaction state." Among the authors' 78 typically tuberculoid cases they found bacilli in 8; six were in a reaction state, two were not.

H. Harold Scott.

SPRECHER, A. Alterazioni patologiche delle ossa nella lebbra. [**Bone Pathological Changes in Leprosy.**] *Pathologica.* 1940, Apr., v. 32, No. 582, 133–48, 15 figs. [24 refs.] English summary.

"The author studies radiologically the pathological changes of the distal bones in twenty lepers with disease of various forms and in various evolution stages. He discusses the radiological findings obtained and reports a first brief histological-pathological examination."

OLMOS CASTRO, N. & BONATTI, A. A. Acerca de la propiedad floculante de los sueros leprosos. [**Flocculation of the Serum in Leprosy.**] *Rev. Argentina Dermatosifilologia.* 1945, Dec., v. 29, No. 4, 290–300, 2 graphs. [25 refs.]

This is a study of the precipitating property of the sera of lepers when in contact with a certain antigen, and of the physico-chemical factors concerned, with a view to devising a method of sero-diagnosis of leprosy.

The antigen is obtained by boiling a leproma nodule in water for half an hour, cutting it in small pieces, brazing to a smooth paste in a mortar, adding chloroform little by little, evaporating this in a water-bath to obtain a residue of bacilli and lipoids. Sulphuric ether is added and the bacilli are separated by centrifuging. The supernatant fluid, rich in lipoids, is evaporated in a porcelain capsule and the residue dissolved in 100 times its volume of 95 per cent. alcohol. After being left for two days it contains a small residue, and an amber-coloured supernatant fluid which is the antigen. About 0·05 gm. of

lipoid, or 5 " mlg."* of antigen, is obtained from 2 gm. of leprous tissue. Before use it is titrated as in the Kahn test, and is suspended in 0·9 per cent. saline (usually 1 to 2·4 or 2·5).

Serum to be tested is inactivated at 56°C. for half an hour ; and for the reaction 0·3 cc. [mlg.] of the serum is placed in a well-slide and 0·05 cc. [mlg.] of antigen suspension is added. The two are mixed by rotary shaking for 4 minutes, then covered with a Petri dish to protect from dust and evaporation, and the result is read off in 10 minutes. If it is positive there is a distinct flocculation, increasing during the next five minutes.

In 17 cases of the lepromatous type of disease the result was positive in 12, and in 3 out of 22 of the tuberculoid type. Of 21 persons living with lepers, but showing no clinical signs of disease, two had positive sera. None of 55 healthy persons reacted positively, nor did any of 11 suffering from dermatoses of a non-leprous nature. Trials were made, varying the dilution of the serum, of using double the amount of serum, reducing or increasing the amount of antigen, but the outcome of all this was to show that the proportions used above were the best. The authors acknowledge that their results are not conclusive and the method cannot be regarded as satisfactory for the diagnosis of leprosy ; they have merely essayed to study the reaction of the sera of lepers towards a specific antigen.

In the second part of this paper, the authors report on tests of the sera of lepers by the Kahn, the Takata-Ara, and the Wolff reactions ; they found that the results closely approximated those with the leproma antigen, and concluded, therefore, that the leprosy results are due to modifications in the colloid state of the serum—colloidal instability due to physico-chemical changes in the serum. *H. Harold Scott.*

Bonatti, A. A. & Olmos Castro, N. Dosaje del complemento en sueros leprosos. [**Complement in the Sera of Lepers.**] *Rev. Argentina Dermatosifilologia.* 1945, Dec., v. 29, No. 4, 301–2.

This investigation was undertaken to determine the complement titre of leper serum, on account of its possible importance as a factor of immunity *in vivo* and its value in precipitation reactions against a prepared antigen *in vitro*.

Thirty-five leper sera and 64 sera from healthy persons were tested and the minimum quantity needed to produce total haemolysis, in the usual haemolytic system, in a mixture of various dilutions of serum made up to 1 cc. was determined. For the healthy persons the average was 0·054 cc. [mlg.], for tuberculoid types of leprosy 0·08, for lepromatous types 0·1 cc. [mlg.]. Loss of titre is marked if the sera are not kept in the ice-chest (4–5°C.). The authors conclude that the titres of complement in leper sera are within the normal limits or slightly below them, and that the diminution is more marked in the lepromatous than in the tuberculoid type. In no case was complement absent.

H. Harold Scott.

Fernández, J. M. M. & Soto, C. M. Tratamiento de las complicaciones oculares agudas de la lepra con esteres bencilicos del chaulmoogra por vía endovenosa [**Treatment of the Acute Ocular Complications of Leprosy by Intravenous Administration of the Benzylic Esters of Chaulmoogra.**] *Rev. Argentina Dermatosifilologia.* 1945, Dec., v. 29, No. 4, 266–72. English summary.

After a few introductory remarks on the seriousness of the acute ocular complications of leprosy and the unsatisfactory results hitherto obtained from

* The contraction mlg. is not explained. It cannot refer to milligrams, since it is used throughout this paper as a measure of volume, *e.g.*, for serum. Presumably it represents millilitres.—*Ed.*

treatment by intramuscular and subcutaneous injections of chaulmoogra (which often, say the authors, makes matters worse) and by protein shock, milk, calcium, autohaemotherapy and other methods, the authors give an account of their own investigations into the use of intravenous injections of benzylic esters of chaulmoogra (Neochaulmestrol).

The mode of administration was intravenously, drop by drop, starting with 0·5 cc. and repeating every 4–7 days and increasing the dose according to tolerance. The patients selected were lepromatous cases with ocular lesions which had proved refractory to the forms of treatment mentioned above. For small doses, up to 3 cc., an ordinary hypodermic syringe was used, injections being made slowly, 1 cc. in 8–10 minutes. In most cases marked improvement followed weekly injections of 1·5–2 cc. In some cases a dosage as high as 10 and even 12 cc. at each session has been attained. The only untoward symptoms have been cough, retrosternal oppression and dyspnoea.

The immediate results have been distinctly encouraging, for with the usual chaulmoogra treatment the eye symptoms may be aggravated, and treatment consequently has to be stopped. With the new treatment the severe pain in the eyes associated with the ocular complications of leprosy disappears, together with the photophobia, lachrymation and corneal oedema. Some of the good, it is thought, may be due to pyretotherapy, for the injections cause a rise of temperature to 38–39°C. with small doses, to 40° and lasting longer with larger doses. The authors acknowledge that the method is only on trial, but they put it forward in order that others may test it also.

Brief notes are given of 20 patients so treated, the total dosage ranging up to 63·5 cc. and the duration of treatment up to 7 months. All improved; some very early in the course and, say the authors, "this drug seems to be the most efficacious of all those hitherto employed in the acute ocular complications of leprosy." *H. Harold Scott.*

Blanco, J. F. Alcoholización del ganglio ciliar. [**Alcohol Injection of the Ciliary Ganglion (in Leprosy).**] *Rev. Argentina Dermatosifilologia.* 1945, Dec., v. 29, No. 4, 275–7.

Injection of alcohol into the ciliary or ophthalmic ganglion is recommended for relief of the ocular pains of leprosy. For preliminary anaesthesia the author injects, at a depth of 4 cm. along the outer wall of the orbit and directed upwards, 1 cc. of adrenovocaine (1 per cent. novocaine with one drop of 1 per cent. adrenaline) and follows this with 1 cc. of alcohol, 60 degrees [presumably 60 per cent.]. The consequent palpebral oedema, slight exophthalmos and sub-conjunctival ecchymosis subside in a few hours. In many lepers the ocular lesions—parenchymatous keratitis secondary to chronic irido-cyclitis, atrophy of the iris, syneciae, pupillary occlusion, repeated scleritis, secondary glaucoma, etc.—render the eye practically functionless.

Six cases are detailed, all adults with advanced leprosy and severe eye symptoms, as mentioned above, and all, within a few days, were much relieved; the pain, photophobia and lachrymation disappeared. Moreover the effect was lasting; the patients were seen periodically, and six months after the injection the improvement was still maintained. *H. Harold Scott.*

Guadagnini, M. Tratamiento de las úlceras leprosas por la novocaína endo-arterial. [**Intra-arterial Novocaine in the Treatment of Leprous Ulcers.**] *Rev. Argentina Dermatosifilologia.* 1945, Dec., v. 29, No. 4, 278–82, 2 figs.

The author is dealing with leprous ulcers of neural origin, in which the actual ulceration is preceded by bullae with serous or sero-purulent content, superficial at first but later extending to the deeper tissues, and in some cases producing the

typical perforating ulcer. They are commonest about the ankles and in the soles. The author's method of treatment, from which he reports good results, is to inject 20 cc. of 2 per cent. novocaine into the femoral artery slowly, taking 3–4 minutes over the injection. A feeling of heat is produced, which persists for 1–2 hours, with rapid alleviation of the pain and ease of movement of the limb. The patient should rest for a few minutes to avoid the sensation of nausea from the novocaine. Injections may be given twice or thrice weekly.

H. Harold Scott.

ARGÜELLO PITT, L. & ALBERTO CONSIGLI, C. Existe una susceptibilidad familiar en la lepra ? Resultado de las observaciones hechas sobre 366 convivientes [**Is there a Family Susceptibility to Leprosy ?**] *Rev. Argentina Dermatosifilologia.* 1945, Dec., v. 29, No. 4, 306–8.

The authors' observations did not lead to a definite conclusion.

HELMINTHIASIS.

RICCI, M. Elmintologia umana dell'Africa Orientale. [**Human Helminthiasis in East Africa.**] *Riv. di Biol. Colon.* Rome. 1940, Aug., v. 3, No. 4, 241–95, 20 figs. [Numerous refs.]

FLOCH, H. & DE LAJUDIE, P. Sur le parasitisme intestinal en Guyane française. [**Intestinal Parasites in French Guiana.**] *Institut Pasteur de la Guyane et du Territoire de l'Inini. Publication No. 121.* 1946, Jan., 4 pp.

BOSCARDI, F. Reperto di *Physopsis africana* nel Sahara libico. [**The Finding of *Physopsis africana* in the Libyan Desert.**] *Riv. di Biol. Colon.* Rome. 1943, Jan.–Apr., v. 6, Nos. 1/2, 39–42, 5 figs.

TUBANGUI, M. A. **Preliminary Notes on the Crustacean Vector of the Mammalian Lung Fluke (*Paragonimus*) in the Philippines.** *J. Parasitology.* 1946, Apr., v. 32, No. 2, 150–51.

Infestation by *Paragonimus* has been known in the Philippines for close on 40 years, MUSGRAVE having reported a case in 1907. It is, however, not widespread, but confined to certain localities. In 1941 snails (mostly *Melania*), crabs (*Potamon*) and prawns (*Palaemon* sp.) were collected and examined. The first and last proved negative, but of 216 crabs, 60 per cent. were found to be harbouring up to 50 cysts, most in the leg muscles, others in the gills, liver and thoracic muscles. Rats and cats fed on these developed adult *Paragonimus*. These crabs are eaten uncooked by the people, after removal of the legs, carapace and gills, or after shaking them with salt and keeping them for 24 hours. The metacercariae in the leg muscles were found to be still alive and infective for 7 hours after such treatment, but not after 24 hours. If merely immersed in water they were still alive after 4 days. Sometimes the crabs are eaten uncooked after immersion in vinegar with a little salt ; in these circumstances the metacercariae were still alive 4 hours later, and infective. The molluscan host has yet to be discovered.

H. Harold Scott.

SUBRAMANIAM, R. **Somatic Taeniasis (Solium Cysticercosis).** *Indian Med. Gaz.* 1946, Feb., v. 81, No. 2, 64–5, 3 figs. on 1 pl.

COGGESHALL, L. T. **Filariasis in the Serviceman : Retrospect and Prospect.** *J. Amer. Med. Ass.* 1946, May 4, v. 131, No. 1, 8–12.

Many doctors in the United States will encounter filariasis for the first time on the demobilization of several thousand servicemen infected with *Wuchereria*

bancrofti during the war. The future of these men and the risk of secondary infection of others are matters of current importance. Bancroftian filariasis was common in the United States, particularly some of the Southern States, during the days of slave importation ; but when these ended the disease was unable to maintain itself, and gradually diminished, finally disappearing in 1925. A similar introduction and temporary lodgement occurred in Australia. At one time 10 per cent. of all persons hospitalized in Brisbane suffered from the infection, which eventually vanished spontaneously from the Dominion. After an account of the life cycle of *W. bancrofti* and of its epidemiology, the author states that any doubts as to the susceptibility of Europeans to the infection, which is rare among those in the Pacific under peace-time conditions, were dispelled in 1942 on the entry of U.S. marines into the Samoan area ; 38,300 men were exposed to risk of infection in areas of high filarial endemicity and 10,421 of them were considered to have become infected.

The diagnosis in the early cases was delayed owing to the lack of familiarity of medical officers with the disease ; but once its occurrence was recognized, all cases on diagnosis were removed at once to the United States. The high infection rate in the marines in the Samoan area was not paralleled elsewhere with an equally high native incidence of the condition. The author explains this as being due to the greater segregation of the troops from the natives in these latter areas, and to the differences in the habits of the vectors, which in Samoa bite by day. The manifestations of the early disease [as recorded recently by numerous American workers] were quite unlike the text book descriptions of the later stages seen in natives reinfected over a period of years. Lymphangitis, lymphoedema and lymphadenopathy are the cardinal early signs and appear after exercise, subsiding with rest in 3 to 5 days. Details are given of the anatomical location of these signs, which were sometimes associated with mild malaise, a slight leucocytosis and low-grade fever. Only 18 (0·07 per cent.) of 2,595 patients seen over a period of 17 months had to be admitted to hospital for a flare-up of the disease. Fears of sexual sterility, impotence, and elephantiasis were soon relieved in the psychologically sound, and were proved by subsequent history to be quite unfounded. Diagnosis of the early infection is by no means easy, and has to be inferred on clinical grounds ; examination of the skin reaction to a filarial antigen gave approximately 85 per cent. of positive results in the infected, but 15 per cent. of normal persons gave false positive reactions.

The signs of early filariasis—happily, in the absence of any specific treatment —vanish spontaneously if the patient is removed from the possibility of further infection. There is little reason to anticipate the re-establishment of the disease in the United States as an aftermath of the war, in view of the light and transient infections being introduced there by the servicemen, and of the fact that when introduced on a more lavish scale in the past, in the highly infested slave population, it failed to maintain itself and died out spontaneously. Release to civil life of the infected veterans can therefore proceed without danger to the community or to the individual. *A. R. D. Adams.*

PLESSEN, M. *Trichocephalus dispar*, **a Pathogenic Parasite.** *An. Inst. Med. Trop.* Lisbon. 1945, Dec., v. 2, 247–66, 2 figs. [15 refs.]

DAY, C. L., WOOD, E. A. & LANE, W. F. **Observations on an Outbreak of Trichinosis among German Prisoners of War.** *J. Roy. Army Med. Corps.* 1946, Feb., v. 86, No. 2, 58–63.

DEFICIENCY DISEASES.

KING, W. D. & SEBRELL, W. H. **Alterations in the Cardiac Conduction Mechanism in Experimental Thiamine Deficiency.** *Pub. Health Rep.* Wash. 1946, Mar. 22, v. 61, No. 12, 410–14, 3 figs. (2 on 2 pls.) [33 refs.]

Various cardiac changes, associated with thiamin deficiency, have been reported. They include in man, shortening of the PQ conduction time, inversion of T waves, increased QRS interval to bundle-branch block, sinus arrhythmia, sinus arrest, premature beats, auricular tachycardia, and tachycardia; in rats, bradycardia, shortened or lengthened PR interval, T wave and ST-segment changes; in pigeons, heart block, tachycardia and inverted T waves; in dogs, deviations of the T wave, lengthening of the QT interval, and tachycardia; in swine, bradycardia, prolonged PR interval, second-degree A-V block, abnormal P waves, inverted T_4, nodal and ventricular premature beats, A-V dissociation, complete heart block with ectopic ventricular rhythm, and auricular fibrillation. Many of these changes were associated with widespread necrosis in the myocardium.

Experiments with rats on a thiamin-deficient diet (except during periods of acute deficiency manifested by spasticity, ataxia and convulsions, at which time the animals were given 50 microgrammes of thiamin subcutaneously) showed that the average heart rate of the deficient animals decreased to 369 beats per minute progressively over a period of six weeks, compared with a rate of 456 beats per minute for control animals, and that in the deficient animals there was a progressive widening of the PR and QRS intervals as well as an increase in the amplitude of the QRS and T deviations. In 4 of 11 animals, auricular fibrillation occurred during their first acute deficiency episode. In 3 of the 4 rats, normal sinus rhythm was restored within 24 hours by the administration of thiamin, the fourth animal dying within 24 hours. In 4 of 11 animals, during their second or third acute deficiency attacks, auriculo-ventricular nodal rhythm was observed, one of the animals having previously shown auricular fibrillation. Premature beats, ectopic beats, bigeminus, auricular standstill and a shifting pacemaker were commonly found among the deficient animals. In two rats, auriculo-ventricular nodal rhythm was not converted to normal rhythm by large doses of thiamin, and in one rat sectioning the vagi did not alter the auriculo-ventricular nodal rhythm.

The changes appear to be the result of abnormal tissue metabolism, and might be expected to vary in degree and persistence, early or slight abnormalities being reversible and more severe deviations representing permanent damage to the tissues.

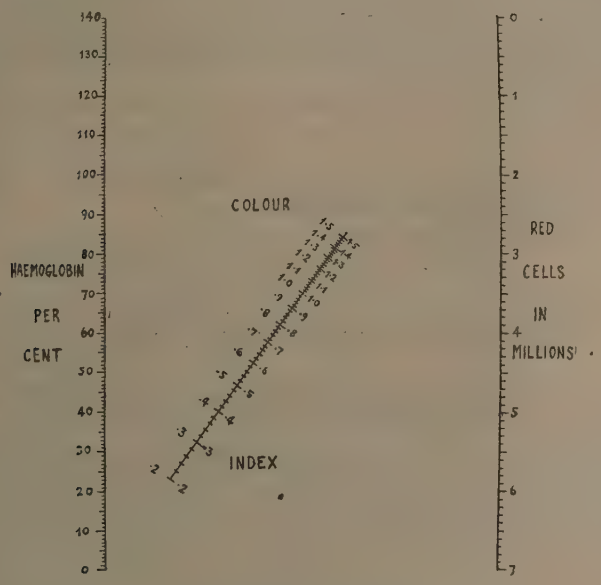
A clinical correlation between thiamin deficiency and thyrotoxicosis has been noted, and the similarity of the cardiac manifestations of thiamin deficiency and those of acute rheumatic fever in young adults has been commented upon. Consequently, since auricular fibrillation may occur in experimental animals apparently as the result of chronic thiamin deficiency, a possible factor in the cause of this arrhythmia in thyrotoxicosis, rheumatic heart disease and the auricular fibrillation of " unknown origin " is suggested.

F. Murgatroyd.

HAEMATOLOGY.

FREEDMAN, B. J. **Colour Index Nomogram.** *Brit. Med. J.* 1946, June 1, 838, 1 diagram.

The colour index is read by placing a ruler on the appropriate points on the red cell and haemoglobin scales, the point of intersection with the middle scale giving a direct reading.



Colour index nomogram.

[Reproduced from the *British Medical Journal.*]

To construct the nomogram draw two parallel vertical scales about 5 in. apart, 1 in. on the scales representing 1 million erythrocytes and 20 per cent. haemoglobin respectively ; the oblique scale is made by joining the two zeros, and is calibrated by laying a ruler across the 5 million mark and the various haemoglobin percentages. It might be drawn on a card and varnished.

J. F. Corson.

DARBY, W. J. **The Oral Manifestations of Iron Deficiency.** *J. Amer. Med. Ass.* 1946, Mar. 30, v. 130, No. 13, 830–35, 3 figs. [Refs. in footnotes.]

Six cases are described in which fissures at the angles of the mouth, and superficial glossitis producing atrophy of the papillae, accompanied chronic anaemia of iron deficiency type. Some of these cases were greatly improved or cured by iron therapy alone ; others responded to administration of iron after prolonged treatment with various preparations of the vitamin B complex.

The first of these patients, a woman of 42 years, had 10·5 gm. haemoglobin per 100 ml. She complained of rawness and burning of the tongue and lips,

pruritus vulvae, listlessness and fatigue, constipation and an attack of diarrhoea. Examination of the mouth showed fissures at the angles, and a swollen dusky tongue with atrophy of the papillae. Treatment for 9 weeks with a mixture providing 12 mgm. thiamin, 4 mgm. riboflavin and 100 mgm. nicotinic acid daily led to no improvement. She was then given 0·3 gm. ferrous sulphate thrice daily. Within a week there was marked subjective improvement; within 3 weeks the tongue appeared normal, the fissures were healed, and the pruritus vulvae had gone. Iron therapy was discontinued after 5 months, and the patient remained well during the succeeding 5 months.

The author believes that iron deficiency alone is a common cause of oral lesions that are confused with signs of deficiency of vitamin B. In his own clinic these signs are more commonly due to iron deficiency than to deficiency of nicotinic acid or riboflavin.

[It is unfortunate that the illustrations are so poorly reproduced as to be almost valueless.] *H. E. Harding.*

PINEY, A. & HAMILTON-PATERSON, J. L. **Sternal Puncture. A Method of Clinical and Cytological Investigation.**

This book is reviewed on p. 870.

DERMATOLOGY AND FUNGUS DISEASES.

ALLEN, R. F. & GOODALE, R. H. **Pinta-like Lesions among Natives of Guam.** *U.S. Nav. Med. Bull.* 1946, May, v. 46, No. 5, 653–62, 6 figs. [31 refs.]

In Guam, particularly in the southern half of the island, a condition known as *peladang* is to be seen among the natives. It is characterized by hyperpigmentation of some and loss of pigment on other areas, on face, hands and feet. The authors found 39 such cases among 2,006 natives inspected; 12 were males, 27 were females, and their ages ranged between the wide limits of 21 and 83 years. Lesions started as small hyperpigmented areas, with itching for a few days; these areas spread, and later the pigment was lost. There was no pain, nor any systemic disturbance. Depigmented areas were greyish-white as a rule; in two patients they were of a pink colour. Biopsy sections showed atrophy of the epidermis and flattening of the *rete* layer. The dermis was infiltrated with lymphoid cells and oedematous, with chromatophores concentrated in the upper layers; the *stratum corneum* was thickened. Twenty-two out of 29 patients tested gave a positive Kahn reaction, but only 56 were positive among 1,000 control natives. Dark-field examinations were made of serum from six patients, but no spirochaetes were seen.

Because much of the study of pinta has been carried out in Mexico, South America and the Caribbean islands, the disease has been thought of as "almost entirely American," but it occurs also in Algiers, the Philippines, Malaya, Egypt, India, Ceylon, the Gold Coast and the Marshall Islands.

H. Harold Scott.

BERLIN, C. **Degeneratio Colloidalis Solaris.** *Harefuah.* Jerusalem. 1946, May 15, v. 30, No. 10. [In Hebrew 240–41, 2 figs. English summary 241.]

"The colloid degeneration of the skin is a common disease in sunny countries. It affects fair-skinned individuals in advanced middle age with outdoor occupations. The eruption is strictly limited to the uncovered surfaces,

particularly the upper half of the face and the back of the hands. The morphological picture is variable. The familiar picture [is that] of small, yellow, closely aggravated [aggregated ?] papules or pseudo-vesicles [but], one may find also smooth, unelevated, shiny, diffuse or island-like spots as well as rough and uneven structures closely resembling citrus peel.

" The colloid degenerated skin is vulnerable, brittle and tends to bleed. This condition was previously described by the author as Purpura Solaris.

" The nail-phenomenon : the appearance of a purpuric streak after moderate to heavy pressure with the free border of the nail is pathognomonic of colloid degenerated skin and is of great diagnostic value in atypical forms.

" Owing to the important role played by the sun in the production of this clinical entity, the name degeneratio colloidalis solaris is suggested for it by the author."

MITRA, S. K. **A Case of Madura Foot treated with Penicillin.** *Indian Med. Gaz.* 1946, Feb., v. 81, No. 2, 82.

HEAT STROKE AND ALLIED CONDITIONS.

RENBOURN, E. T. **Observations on Normal Body Temperatures in North India. With a Statistical Analysis** by F. F. BONSALL. *Brit. Med. J.* 1946, June 15, 909–14, 9 figs.

The body temperatures of 894 soldiers—British and Indian—were recorded during the period from March to September 1945 at Dehra Dun, North India ; clinical thermometers were used and both oral and rectal temperatures were taken, but not in every individual. Altogether 1,800 temperature recordings were made. The British soldiers had been in India for periods ranging from 4 months to 2 years. The figures of various records of groups of men are shown in tables and diagrams and are examined statistically and the original paper should be consulted for the details.

The following are some of the results and conclusions : oral temperatures up to 100·6°F. and rectal temperatures up to 101°F. may occur in normal individuals ; the temperatures of British and Indian soldiers were much the same and acclimatization does not seem to be an important factor ; resting oral temperature showed no correlation with erythrocyte sedimentation rate nor with the presence of prickly heat ; temperatures rose slightly with the onset of the hot weather and fell at the end of the monsoon period ; temperatures varied during 24 hours by from 1 to 2·6°F. in 90 per cent. of 36 diurnal curves of 14 individuals ; exercise in the rain may cause a fall in oral temperature but in dry weather it causes a rise. *J. F. Corson.*

REES, W. H. & OGDEN, L. W. **Some Observations upon the Effect of Colour on the Absorption and Emission of Radiation by a Textile Fabric.** *J. Textile Inst.* 1946, Apr., v. 37, No. 4, T113–20, 3 figs.

This very concise paper deals with experimental tests which have yielded much-needed information in regard to the relative effects of colour on the absorption, reflection and emission of radiation falling within specified ranges of wavelength.

Samples of a standard poplin fabric dyed in a wide variety of colours were exposed to radiation from a high-intensity carbon arc emitting wavelengths, closely corresponding to those in natural sunlight, over a range of 0·2 to 1·5

microns, and to medium temperature radiation from an electric radiator at 900°C., emitting visible red and infra-red wavelengths with a maximum emission of about 2·5 microns.

Experiments are also described which provided data for the emission of radiant energy by coloured samples of the fabric kept at approximately a body-surface temperature of 36°C., *viz.* for wavelengths ranging from 5 to 16 microns.

It is pointed out that, as far as radiation is concerned, clothing may be required for two distinct purposes: to protect by reflection or non-absorption of solar radiation, as in the tropics; and to reduce body heat loss due to radiation, as in cold climates.

In the experimental method employed for determining the effects of colour on the rate of absorption of radiant energy, two kata-thermometers, one of which was clothed with a tight-fitting sleeve of the fabric sample under test, were simultaneously exposed to radiation from the high-intensity carbon arc or from the electric radiator.

In the experiments on emissivity, a Moll microthermopile and sensitive galvanometer were used to observe the emission of low-temperature radiation from a black body at 36°C., and from various samples of coloured fabric held in close contact with the sides of a copper cylinder kept at 36°C. The true emissivity of the fabric was calculated from the observed emissivity by applying a correction to allow for the slightly lower temperature of the external radiating surface of the fabric.

The results of the tests are given in a table from which the following data have been abstracted.

Colour Dyed cotton fabric	Relative Absorption (taking Sulphur Black as unity)		Emissivity (% of perfectly black body) For surface temperature at 36°C.
	For radiation from high intensity arc	For radiation from electric radiator at 900°C.	
			%
Sulphur Black	1·00	1·00	99
Vat Black	0·80	—	98
Vat Yellow	0·51	0·99	98
Vat Orange	0·52	0·99	98
Azoic Red	0·54	0·99	99
Vat Blue	0·61	0·99	98
Vat Green mixture ...	0·61	0·99	98
Vat Violet	0·61	—	99
Vat Khaki	0·59	0·99	98
Direct Khaki	0·50	—	98
Sulphur Khaki	0·69	—	99
Bleached (White) ...	0·39	1·00	98
Aluminium foil	0·04	<0·10	9

It is observed that while the colour of a fabric is a most important factor in determining the absorption of solar radiation, it is of "no importance in determining the emission at the long wave-lengths associated with body temperature," and even with radiation from the electric radiator at 900°C. the differences between the colours are very small. At body temperature a textile (non-metallic) fabric, whatever its colour, behaves practically like a black body

in respect of the emission or absorption of long-wave radiation associated with such a temperature, namely, having the capacity for maximum emission, maximum absorption and minimum reflection.

It is noted that the properties of very low emissivity and low absorption possessed by aluminium foil are made use of in military topees, and the design of tropical tents to make use of these properties is referred to.

The concluding part of the paper draws attention to the fact that colours which appear roughly alike to the eye may have markedly different absorption characteristics, particularly for the near infra-red wavelengths which account for approximately 20 per cent. of the total energy in sunlight at earth level. The inference is drawn that to ensure maximum protection against solar radiation, dyes giving a minimum absorption in the near infra-red region should be selected. A plate showing infra-red photographs of the dyed cotton fabric is included in the paper, and the problem of camouflage is referred to.

G. P. Crowden.

MISCELLANEOUS DISEASES.

SMITHBURN, K. C. **Semliki Forest Virus. III. Propagation of the Virus in Developing Chick Embryos.** *J. Immunology.* 1946, Apr., v. 52. No. 4, 309–14, 1 fig.

This paper records the successful propagation of the Semliki virus through 33 serial passages in the embryo chick [for a description of this virus see this *Bulletin*, 1945, v. 42, 320]. The series of passages was initiated with a filtrate prepared from an infected mouse brain injected into the region of the developing chick embryo [see ELMENDORF and SMITH this *Bulletin*, 1937, v. 34, 692]. Eggs incubated for 7–9 days prior to inoculation were employed, and passage was performed with a filtrate of ground-up embryo. Virus multiplied readily and embryos succumbed between the 11th and 24th hours after inoculation. Tests for the presence of virus were made by intracerebral inoculation in mice. The infective titre of embryonic chick tissue varied between 1 in $3{\cdot}65 \times 10^6$ and 1 in 210×10^6, and there was no decline on passage. Detailed experiments showed that virus could be detected in the developing embryo from about the 4th hour of incubation onwards. The virus content seemed to remain more or less stationary after the death of the embryo. The curve of multiplication proceeded, up to 12 hours, by logarithmic progression. Beyond that point there was a flattening of the curve but a further absolute increase.

Macroscopically the embryos showed varying degrees of hyperaemia and haemorrhage. Microscopic examination showed dilatation and congestion of vessels and extravasations, especially in the subcutis. Necrosis of cells occurred only to a slight extent and was not marked in any special tissue.

A. J. Rhodes.

WINKENWERDER, W. L. **Asthma—as observed Overseas in a General Hospital in the Southwest Pacific Area—with special reference to Relationship of Tropical Service to Onset and Recurrence.** *Bull. Johns Hopkins Hosp.* 1946, Feb., v. 78, No. 2, 78–95.

It is a curious fact that none of the standard works on tropical medicine deals with, or even comments on, the ill effects of tropical climate and conditions on the asthmatic state, or on the tendency for asthma to develop in such circumstances. This article has, therefore, a special value since it attempts to treat the subject scientifically.

The facts presented are based on a study and analysis of 209 cases among 352 American soldiers admitted to a South Western Pacific General Hospital during a period of two years, ending July, 1944, on account of asthma. These were readily divisible into two groups of nearly equal numbers: 107 who had suffered from asthma prior to enlistment, and 102 who developed it after entering the service.

Among those in Group I a personal history of hay fever or asthma was elicited in 74 (69·1 per cent.) and a family history in 59 (55·1 per cent.) as compared with 48 (47 per cent.) and 30 (29 per cent.) in Group II. The time elapsing between arrival in the tropics and recurrence or aggravation of the older-standing asthma was noted in 74 patients; in 62 (83·7 per cent.) it was within 3 months, and in 46 (62 per cent.) within one month, whereas among 61 who had no previous history of previous attacks 46 (75 per cent.) developed symptoms in 3 months, 3 within a week, 14 within a fortnight and 27 within a month. The monthly distribution was examined in 104 of Group I and 61 of Group II; April and May accounted for 33 (31 per cent.) of the former, and most cases, 16, of the latter occurred in May; but the author, on further study, came to the conclusion that "the date of arrival rather than environmental factors controls the monthly distribution of recurrence onset."

Several pollen extracts and inhalant dusts were tested for allergy of patients. Of 48 of Group I tested against the former 35 were positive, as compared with 22 of 35 in Group II; 74 out of 86 of Group I tested with inhalant dusts were positive and 46 out of 76 of Group II.

Attempts were made also to evaluate the immediate, precipitating cause or combination of causes. Among those of Group I, 2 were thought to be directly due to pollen alone, 49 to pollen and inhalants, 37 to inhalants alone. 5 to upper respiratory infection (sinus trouble, polyp, chronic tonsillitis) and 4 to lower respiratory infection, such as bronchitis or pneumonia. The respective figures in Group II were: 0, 15, 12, and 20 to respiratory infections (no distinction is made between upper and lower); in 54 instances no determination could be reached.

Duration of disability differed in the two groups. In the first, the minimum and maximum days' stay in hospital were 5 and 224, with an average of 60·24; in the second the respective figures were 6, 181 and 57·7 days. Desensitization was undertaken in a few cases; 28 to inhalant dusts, 3 to pollen and inhalants combined, and 7 to histamine. No valid conclusion as to the efficacy of these procedures was reached, but "in a small number of cases, such treatment appeared to be beneficial and abled the patient to remain on duty." [As stated, this is an important article, although the number of patients was small. Abstraction has been difficult because many of the figures and calculations based on them are erroneously stated.] *H. Harold Scott.*

MENON, I. G. K. **Tropical Eosinophilia: some further Observations.** *Indian Med. Gaz.* 1946, Feb., v. 81, No. 2, 70–73. [10 refs.]

An interesting series of observations showing that the so-called tropical eosinophilia, though most of the cases have been reported from India and Ceylon, has in reality a wider distribution, being found in China, Havana, America, Tanganyika, Samoa and other places. The author gives details of blood counts in patients with asthma, and useful diagnostic deductions therefrom. Thus, in one case, with a total leucocyte count of 9,800 per cmm., a 12 per cent. eosinophilia and an erythrocyte sedimentation rate of 2 and 5 mm. in one and two hours, a diagnosis of asthma may be made with practical certainty. In another, with a total of 10,000, an eosinophilia of 43 per cent. and sedimentation rates of 10 and 30, W.R. negative and no response to

arsenic, the diagnosis is in favour of asthma as against tropical eosinophilia. In a third, with 13,000 leucocytes per cmm., 25 per cent. eosinophiles, without lung signs, there was a personal and family history of asthma. But the patient was a child, whose blood gave strongly positive Wassermann and Kahn reactions, while in the parents they were negative, and rapid improvement followed the giving of stovarsol. Hence the diagnosis is in doubt and the weight of evidence seems to be more on the side of tropical eosinophilia. Lastly, an adolescent with a history of asthma, with fever and cough, a total white cell count of 49,500, an eosinophilia of 79 per cent., sedimentation rates of 39 and 86 in one and two hours respectively, strong Wassermann and Kahn reactions and response to arsenic. Here the diagnosis would be "tropical eosinophilia in a previously asthmatic subject."

Intraperitoneal inoculation of blood of a tropical eosinophilia patient into guineapigs yielded inconclusive results, but only a single injection was given. The effects point equally well to infection or to reaction to a "metabolic product derived from the organism or the patient's tissues." Further work is necessary in this, but up to the time of writing the author had not been able to obtain fresh blood from a typical case of the disease. *H. Harold Scott.*

HUNTER, E. A. **A Case of Tropical Eosinophilia (Weingarten's Syndrome).** [Memoranda.] *Brit. Med. J.* 1946, June 8, 877.

The patient was a European man, aged 37, who had spent 12 years in Nigeria and during that period had suffered only from infective jaundice and subtertian malaria. Within 6 months of his return to England he began to have attacks of asthma at night, with paroxysmal cough and orthopnoea; the attacks were not very severe or prolonged. A skiagram of the chest was normal.

A blood count, made during an attack of malaria, showed 12,400 leucocytes with polymorphonuclears 20 per cent. and eosinophils 59 per cent., and there were some myelocytes. There were no signs of helminthic infection. No treatment was given and during the following year he had occasional attacks of asthma and another attack of malaria. About 18 months after the first attack of asthma he had a febrile attack lasting for some days with nocturnal asthma and widespread urticaria. His blood showed 36,200 leucocytes with polymorphonuclears 10 per cent. and eosinophils 70 per cent. He was given three injections of neoarsphenamine (N.A.B.) at weekly intervals and improved rapidly; when last examined his blood showed 5,800 leucocytes with polymorphonuclears 58 per cent. and eosinophils 5 per cent. *J. F. Corson.*

VAN DER SAR, A. **Pulmonary Acariasis. Its Relationship to the Eosinophil Lung and Löffler's Syndrome.** *Amer. Rev. Tuberculosis.* 1946, May, v. 53, No. 5, 440–46, 8 figs. [14 refs.]

Writing from Curaçao, the author gives a record of eight patients, ranging in age from 8 to 48 years, four of whom were sufferers from asthmatic attacks for short periods, two of them for 3–5 weeks, two for 3–4 months, worse at night. The other four suffered from bronchitis but not asthma; one had tuberculosis of the lungs. It is interesting that two of the patients were sisters living in a house where, within the preceding 3 years, two patients had suffered from "tropical eosinophilia." In the sputum of each of the eight, mites were found; in one an adult *Tyroglyphus*, in the others hypopal stages. They are well shown in photographs. X-rays revealed enlarged hilar markings, fine mottling and pulmonary infiltrations, except in one case in which nothing abnormal was found. Blood examination showed leucocytosis ranging between 12,000 and 20,700 per cmm., with eosinophiles up to 80 per cent. at the beginning of

observations and final percentages between 4 and 11, after treatment, four with " mafarside injections [no dose stated] every 5 days," the others with " carbason [presumably carbarsone] 3 times a day for 10 days " [again no dose mentioned.] The total counts (after treatment) were normal (6,800 to 9,100) in seven, reduced in one (4,500) ; the eosinophile percentage in two patients was reduced to 4, in two others to 5 and 7 respectively, to 8 in three ; the one with 11 per cent. had the lowest early total count, 12,000 per cmm. [Many other observers have not found mites in the lungs and sputa of patients with " tropical eosinophilia " and the author seems to be begging the question in his conclusion : " The question why in some cases the mite infection manifests itself as tropical eosinophilia, in other cases as Löffler's syndrome and . . . without any roentgenological abnormalities while a leucocytosis with eosinophilia persisted, must remain unanswered for the time being." It is still a moot point whether " tropical eosinophilia " and Löffler's syndrome are really different diseases.] *H. Harold Scott.*

WEBER, H. M. **Roentgenologic Changes observed in Tropical Diseases.** *Amer. J. Med. Sci.* 1946, May, v. 211, No. 5, 629–36. [11 refs.]

GENERAL PROTOZOOLOGY.

ADAMS, F. H., HORNS, R. & EKLUND, C. **Toxoplasmosis in Large Minnesota Family.** *J. Pediatrics.* 1946, Feb., v. 28, 165. [Summary taken from *J. Amer. Med. Ass.* 1946, May 18, v. 131, No. 3, 259.]

Adams and his co-workers studied a typical case of toxoplasmosis in a 14-year-old girl who was a member of a large Minnesota family. The patient had 10 living siblings and 5 other close relatives. Complete physical studies, including funduscopic examinations, were made on 11 members of the family. Neutralization tests against the toxoplasma organism were done on blood serum from these and four other members of the family group. Positive neutralization tests against the toxoplasma organism were present in the patient, her mother and 8 of 9 siblings tested. The mother and the 9 siblings had no clinical symptoms or signs of toxoplasmosis as determined by physical and roentgenologic examination. Whether infection in this patient and her siblings was congenital or acquired could not be ascertained.

KARNAKY, K. J. **Trichomoniasis. A Twelve Year Study.** *Western J. Surgery, Obstet. & Gynecol.* 1946, Feb., v. 54, No. 2, 61–4, 2 figs.

The author, who has been studying *Trichomonas vaginalis* infections for some 12 years, gives in this paper his experience as regards diagnosis and treatment. For the former, discovery of the organism by microscopic examination is essential, though the occurrence of a secretion which " scalds " the external genitalia is very suggestive. For treatment the best results have been obtained by inserting Floraquin tablets twice daily for 12 days, followed by douching with a vinegar lotion two or more times a day for at least three months.

C. M. Wenyon.

GENERAL ENTOMOLOGY.

HADDOW, A. J. **The Mosquitoes of Bwamba County, Uganda. IV. Studies on the Genus** *Eretmapodites*, **Theobald.** *Bull. Entom. Res.* 1946, May, v. 37, Pt. 1, 57–82, 9 figs. [10 refs.]

In 1941, after the isolation of the yellow fever virus from a human patient and from wild-caught mosquitoes in Bwamba, intensive entomological investigations were started and are still proceeding. The topography and vegetation of the area has already been described and the results of day-and-night mosquito catches have been discussed [see this *Bulletin*, 1946, v. 43, 79, 80, 255].

The present paper is chiefly of interest to the medical entomologist as it concerns the taxonomy and bionomics of eight species of mosquitoes of the genus *Eretmapodites* which occur in Bwamba; one of these is new to science (*E. ferox*) and is described. The larva and pupa of *E. inornatus* and the larva, pupa and female of *E. penicillatus* are described for the first time. The author criticizes the diagnostic value of certain characters used in existing descriptions and keys, and gives amended keys to the known males, females, pupae and larvae, though some species still have to be grouped together.

Eggs of *Eretmapodites* are laid in small numbers at frequent intervals at the edge of small collections of water in such things as fallen leaves, plant axils and snail shells. The eggs sink and are unable to withstand desiccation. Many experiments show that larvae of the Bwamba species prey on other small aquatic animals, including mosquito larvae. Pupae move sluggishly and sometimes lie on one side as if dead. The genus is confined to forest and dense vegetation, and females bite by day, particularly in the late afternoon; 6,500 of all local species were taken biting man in Bwamba.

In 1928, Bauer successfully transmitted yellow fever to rhesus monkeys by the bite of *E. chrysogaster*, a species which will breed in small cages. The yellow fever virus has not yet been isolated from specimens taken in Bwamba, though three strains of a virus related to that of Rift Valley fever have been isolated. It is suggested that species of *Eretmapodites* may include transmitters of human and animal viruses. *H. S. Leeson.*

DA CRUZ FERREIRA, F. & DE MEIRA, M. T. V. Espécies de Phlebotomus de Lisboa e arredores. II. Sobre a presença de *P. ariasi* ♀ em Lisboa. [**Species of** *Phlebotomus* **found in Lisbon and its Environs. II. On the Female** *P. ariasi* **in Lisbon.**] *An. Inst. Med. Trop.* Lisbon. 1945, Dec., v. 2, 207–15, 2 figs. (1 on pl.). [14 refs.] English summary.

The authors have studied the morphology and recorded measurements of six specimens of female *P. ariasi*. In a detailed table they give their own findings and, for purposes of comparison, those of RAYNAL and LE GAC (1933), PARROT (1936–40) and ZARIQUEY (1937). They give the measurements of the head, thorax, abdomen, palps, antennae, the wings, the three pairs of legs and the spermathecae.

In a separate section of this article they record their study of over 4,000 specimens of *Phlebotomus* captured in Portugal during 1944. By far the majority were *P. perniciosus*, 96·7 per cent.; *P. minutus* came next, 2·7 per cent., *P. ariasi* 0·4 and *P. sergenti* 0·2 per cent. The last were most common in fowl-runs, the others in human dwellings. The relative proportions of the sexes were; *P. perniciosus*, twice as many females as males, *P. minutus* in equal proportions; *P. ariasi* three males to one female; *P. sergenti* five males to one female. *H. Harold Scott.*

COOLEY, R. A. [Senior Entomologist] & KOHLS, Glen M. [Assoc. Entomologist, U.S. Pub. Health Service]. **The Genus *Ixodes* in North America.** *Nat. Inst. of Health Bull. No. 184.* Wash. 1945, iii+246, 87 figs. [40 cents.]

This monograph contains an account of the principal characters of the genus *Ixodes*, with separate keys to females, males and nymphs. These preliminaries are succeeded by systematic descriptions of 41 species ; females, males and nymphs are considered separately for each species, the various points being illustrated in line drawings, and there is a section, for each species, on hosts and geographical distribution in the United States, with a map. At the end there is a note on doubtful species, a table showing geographical distribution, a classified list of hosts, and a list of references.

The monograph is of the high standard usually maintained in this series of National Institution of Health Bulletins, and will be an invaluable work of reference to those interested in the subject. *Charles Wilcocks.*

STELLA, E. Nuovi dati sugli Ixodidi dell'Africa Orientale Italiana. [**New Data on the Ixodidae of Italian East Africa.**] *Riv. di Biol. Colon.* Rome. 1940, Dec., v. 3, No. 6, 431–5.

NESBITT, H. H. J. **A Revision of the Family *Acaridae* (*Tyroglyphidae*), Order Acari, based on Comparative Morphological Studies. Part I. Historical, Morphological, and General Taxonomic Studies.** *Canadian J. Res.* Sect. D. Zool. Sci. 1945, Dec., v. 23, No. 6, 139–88, 55 figs. [52 refs.]

WISECUP, C. B., BROTHERS, W. C. & EIDE, P. M. **Airplane Spraying of Rice Fields with DDT to kill Mosquito Larvae.** *J. Econom. Entom.* 1945, Dec., v. 38, No. 6, 686–8.

Rice fields in Stuttgart, Arkansas, are first flooded when the rice is young, in June, then allowed to dry for the control of insect pests, and then again flooded, in intention continuously throughout July and August. In practice, however, there may often be a series of alternate floodings and dryings during these months, and ideal breeding conditions for mosquitoes of the genus *Psorophora* and for *Anopheles quadrimaculatus* are produced. DDT applied from aircraft in xylene water emulsion at the rate of 0·1 lb. or more per acre gave perfect initial control of breeding up to mid-July, when the thickening vegetation made bigger doses necessary, of the order of 0·5 lb. per acre.

Under circumstances of this type it is essential that large areas of crop should be treated simultaneously, and therefore most desirable that some larvicidal effect be produced in fields which, though dry at the time of spraying, are flooded soon after. Very efficient "preflooding control" of this type was secured against *Psorophora* with doses of 0·2 lb. per acre or over. Against *A. quadrimaculatus*, doses of 0·1 and 0·2 lb. per acre gave doubtful or no "preflooding control," and of the two trials with 0·5 lb. per acre, one gave good and one doubtful control.

Doses under 0·5 lb. per acre had a residual effect for about two weeks, during which no larvae were seen, though mature larvae were not seen for a considerably longer period. With doses of 0·5 lb. per acre the initial complete elimination was maintained for three to four weeks.

No damage to developing rice could be observed during the season, and random counts of heads of rice from treated and control blocks showed no difference in the number of plump grains that had been produced.

G. Macdonald.

FENNAH, R. G. **Preliminary Tests with DDT against Insect Pests of Food-Crops in the Lesser Antilles.** *Trop. Agriculture.* Trinidad. 1945, Dec., v. 22, No. 12, 222–6.

This paper, which is mainly concerned with the agricultural uses of DDT, includes a table showing the mortality amongst about 40 species of insects of agricultural importance after exposure to standard doses of DDT. The author considers that, in view of its concomitant effect on beneficial insects, the question of whether DDT should be used on any particular crop in any particular Colony can only be settled by considering each case separately in the light of existing local circumstances. In the case of the major food-crop pests in the Windward and Leeward Islands there is little objection to its use.

A spray of DDT emulsion, at 200 mgm. per sq. ft. on and around manure heaps, had an immediate effect in controlling flies, but little residual effect, owing to the normal disruption of the surface, which exposed untreated portions to which flies could gain access without damage. As a method of fly control in dairies it was concluded that complete treatment of exposed manure heaps, at frequent intervals, should be combined with limited treatment of carefully selected surfaces in the dairy, such as hanging fixtures, sides of windows and doors, sunlit areas on walls and floor in the food-mixing room, the mixing trough and the surfaces of sacks of feed. *G. Macdonald.*

STAMMERS, F. M. G. & WHITFIELD, F. G. S. **Toxicity of DDT to Man.** [Correspondence.] *Nature.* 1946, May 18, 658. [Summary appears also in *Bulletin of Hygiene.*]

At the Royal Naval School of Tropical Hygiene in Colombo, a team of 15 men (1 Tamil and 14 Sinhalese) was employed continuously for 5 to 7 months in preparing and spraying a kerosene solution of DDT (5 per cent.). On an average, 24 hours per week were actually spent in spraying. At the beginning protective clothing and gauze masks were issued, but owing to the heat, the men refused to wear these protective devices. Most of the spraying was done in confined spaces and the men were often exposed to splashes and drip from the ceilings as well as to leakages from the sprayers (which received rather hard treatment). After a day's operations, a white frost of DDT crystals could be seen on exposed portions of skin, while overalls were frequently saturated.

Despite this very considerable degree of exposure to DDT, none of the men developed signs or symptoms of intoxication. Each man was questioned as to general fitness and received a clinical examination. Liver function was estimated by the oral hippuric acid synthesis test, and haemoglobin estimations, red- and white-cell counts including differential white-cell counts were made; examination of urine for abnormal constituents and stools for parasitic ova, worms and cysts were also carried out. Similar examinations were made on a control group of men. No evidence of ill-health due to DDT was detected.

J. R. Busvine.

LABORATORY PROCEDURES.

SPENCER, G. J. **A Cheap and Speedy Method of Cleaning Old Microscope Slides.** *Science.* 1946, Apr. 12, 456–7.

Slides and coverslips of preparations mounted in canada balsam are easily and quickly cleaned by immersion in a 10 per cent. solution of NaOH kept near its boiling point. Some form of slide holder, such as a spiral copper wire,

which will keep the slides separate from each other is necessary, and the hot NaOH can conveniently be kept in a beaker standing on a tripod over a low Bunsen flame. The slides and coverslips are afterwards washed in hot water.

J. F. Corson.

MOHUN, A. F. **The Serum Albumin and Globulin Levels in Africans as compared with Europeans : with a Note on Technique.** *Ann. Trop. Med. & Parasit.* 1946, Apr., v. 40, No. 1, 29–33, 2 figs.

The serum albumin and globulin levels in 30 healthy young Africans serving in the army in the Gold Coast were compared with those of 30 Europeans from the Army in the area, all of whom had been in the tropics for some time. Proteins were fractionated by the cold methanol technique of PILLEMER and HUTCHINSON (*J. Biol. Chem.*, 1945, v. 158, 299). The results by this method agree with those found by electrophoresis ; the albumin/globulin ratio is about two-thirds of that given by neutral salt fractionation. A technique is described for filtering off the precipitated globulin without allowing the temperature to rise above 2°C. in spite of tropical conditions, and without special apparatus.

The results are summarized in the following table :—

Mean levels	Albumin gm. per cent.	Globulin gm. per cent.	Total Protein gm. per cent.	Albumin/ Globulin gm. per cent.
Africans	3·45	3·76	7·21	0·93
Europeans	4·3	2·56	6·86	1·7
Significance of differences	+	+	Doubtful	+

Even lower albumin/globulin ratios were found in other cases : *e.g.* in five pregnant women, 0·45–0·7 ; in five children with nutritional deficiency, 0·3–0·9 ; in one case of hepatic cirrhosis, 0·1.

J. C. Waterlow.

ADAMS, Margaret A. & BALLOU, Alice N. **A Comparison between the Values for Plasma or Serum Protein as obtained by the Specific Gravity and the Micro-Kjeldahl Methods.** *J. Lab. & Clin. Med.* 1946, May, v. 31, No. 5, 507–13, 2 figs. [12 refs.]

" 1. One hundred and twenty-eight cases are presented in which the serum protein concentration was determined by both the micro-Kjeldahl procedure and by the copper sulfate specific gravity method.

" 2. In fifty-five of the 128 cases, or 44 per cent, the differences between the total protein values by the two methods did not exceed 0·3 Gm. per 100 c.c. of serum. The percentage of cases showing such agreement was slightly lower when the albumin was below normal or the globulin above normal. When 0·2 Gm. per 100 c.c. is taken as the criterion for duplication, only 35 per cent of the cases showed such agreement.

" 3. No conclusions could be drawn as to the type of patient in whom the serum specific gravity is influenced by factors other than the protein content.

" 4. The correlation between the specific gravity of serum and its protein content was found to be too low to permit the use of specific gravity determinations for reliable estimation of serum total protein."

REPORTS, SURVEYS AND MISCELLANEOUS PAPERS.

KEAN, B. H. **Causes of Death of Children on the Isthmus of Panama.** *Amer. J. Dis. Children.* 1946, Apr., v. 71, No. 4, 351–6.

Complete post-mortem examinations were made on 2,132 children under 11 years of age who died in the Isthmus of Panama during the 39 years from 21 October 1904 to 7 November 1943; histological sections were examined in nearly all cases. The children included British West Indian Negroes, Panamanian "mestizos" (mixed Indian, Spanish, and Negro), and United States Whites. The causes of death, the primary cause being selected, are given in a table in which total cases, groups in three periods of the 39 years, sex groups and groups of race or origin are shown. Half of these deaths were due to :—

Tuberculosis, 217; malaria, 92; bronchopneumonia, 160; lobar pneumonia, 59; diarrhoea and enteritis, 180; bacillary dysentery, 29; congenital debility (under 1 year), 271; premature birth, 184.

The author does not discuss the subject. *J. F. Corson.*

LOWE, J. **Some Recent Advances in Tropical Medicine.** *Indian Med. Gaz.* 1946, Feb., v. 81, No. 2, 86–96.

CONNECTICUT STATE DEPARTMENT OF HEALTH. **Nomenclature of Pathogenic and Parasitic Organisms** [OSBORN, S. H., M.D., C.P.H., Commissioner, Hartford, Connecticut]. 66 pp. 1945. [Summary appears also in *Bulletin of Hygiene.*]

This booklet is intended as a companion and supplement to the "Physicians' Guidebook to Public Health Laboratories" published by Connecticut State Department of Health [*Bulletin of Hygiene*, 1946, v. 21, 151]. It contains lists of the scientific names of organisms arranged in eight sections and in alphabetical order of genera in each section, with short notes on each species; the sections include bacteria, rickettsiae, fungi, protozoa and worms. The nomenclature of the bacteria is, with few exceptions, that of "Bergey's Manual of Determinative Bacteriology," 5th Ed.; although that manual was being revised the author decided not to delay the publication of this booklet until the appearance of the revised edition. In the case of the fungi, Dodge's "Medical Mycology" was taken as the authority; in other sections authorities were more in agreement as to the nomenclature. There is an alphabetical index at the end of the book.

This booklet will be very useful to medical practitioners in connexion with laboratory reports and in other ways. *J. F. Corson.*

BOOK REVIEWS.

NAPIER, L. Everard [Companion of the Order of the Indian Empire, F.R.C.P., etc.]. **The Principles and Practice of Tropical Medicine.** pp. xvi+917, 195 figs. & 24 pls. (4 coloured). 1946. New York: The Macmillan Company, 60 Fifth Avenue. [$11.00.]

On any count this is a good book. It is full, accurate, readable and orderly, and it gives throughout the impression that its author writes from an exceptionally wide personal experience, and that he has an enquiring mind. Where a point is in doubt, he gives the arguments on both sides, but generally makes up his own mind, one way or the other, and says so. His writing is none the worse for a substratum of scepticism and a style which is, at times, sufficiently emphatic.

Napier makes it clear that he has written for the student, the practitioner and the public health worker, and that the work is rather a textbook than a book of reference ; but this is too modest a claim. He has deliberately omitted smallpox, typhoid fever, tuberculosis and the systematic mycoses, but has included tularaemia. The chapters on bejel and leprosy were written by Dr. H. SENEKJIE and Dr. John LOWE respectively, and acknowledgment is made of the collaboration of Dr. R. N. CHAUDHURI, Dr. Sundara RAO and others. It is evident that the author has been at pains to secure expert advice on many subjects. In a footnote it is stated that the first part of the book was published in India in 1943, and that the completed work has now been published in the United States; it is now available in Britain. It has been possible to make a few additions to the first part, but for various reasons these have had to be strictly limited. This probably explains why the outstanding work on mepacrine, both for treatment and suppression of malaria, carried out in the later stages of the war, is alluded to somewhat briefly, and that the doses recommended in the body of the chapter on malaria, which derive mainly from an experience of partly immune persons, are not so high as those quoted later and found necessary for non-immune soldiers operating in malarious countries. Many short addenda, referring to recent work, are included in these earlier chapters, and in later editions will, no doubt, be fitted more closely into the text.

The first chapters deal with environment, and with climate and its effects, including heat stroke and allied conditions ; these are full of good sense. Medical men will generally agree with the author in what he writes of exercise, diet, drinking, etc., but it is not easy to get these ideas into the minds of the non-medical white settlers in the tropics.

The chapter on malaria occupies about 70 pages. It is very full, and the clinical aspect is particularly well covered ; perhaps rightly, the vast subject of anti-larval measures of control receives only general treatment, readers being referred to the special literature on the subject. The spray-killing of adult mosquitoes is described more fully, but DDT needs more mention. Incidentally, DDT is not a mosquito repellent, as is suggested on p. 118. Writing of malaria control, Napier remarks that " The economic aspect will always be paramount in this imperfect world. One's first thoughts must be, how much will it cost and will it pay ? " The reviewer must dissent ; it is his belief that a doctor's first business is to promote good health, that commercial considerations must give way to considerations of human welfare, and that it is the duty of medical men to insist on this.

The chapter on kala azar is very good indeed. The author has had a vast experience of the disease (he has seen more than 10,000 cases), has done much original work, and has been closely associated with the research conducted in India during the last quarter of a century. The result is a highly informative and authoritative chapter, fully up to date. This, however, is not quite true of the chapter on trypanosomiasis. For instance, a sentence on p. 201 suggests that man is less susceptible to infection with *Trypanosoma rhodesiense* than with *T. gambiense*; the remark that sleeping sickness may be transmitted during coitus might be deleted ; no mention is made of transmission by *Glossina pallidipes* ; control measures are not very fully discussed. Nevertheless, the bulk of the chapter is good and accurate. The theory of drug resistance which appeals to the author—that it is a matter of selection of resistant strains of trypanosomes—also appeals to the reviewer.

The relapsing fevers, leptospirosis, the fevers of the typhus group, bartonellosis, yellow fever, dengue, plague, tularaemia, the undulant fevers, and melioidosis are all adequately described, and the account of cholera is on the same high level as that of kala azar ; here again there is evidence of a very wide

personal experience of the disease. For infections with *Entamoeba histolytica* the author prefers to discuss amoebic dysentery as the primary manifestation and to treat the other lesions due to the same organism as complications or sequelae ; amoebic hepatitis is given a separate chapter. The flat statements on pages 428 and 429 that chlorination of water does not kill cysts of *E. histolytica* need modification in view of the work of CHANG, FAIR and their collaborators [this *Bulletin*, 1942, v. 39, 313 ; 1945, v. 42, 286, 734], who have shown that the concentration of gaseous chlorine needed to destroy the cysts lies well within the range of practicable superchlorination. Sprue is well described, and a separate section is devoted to hill diarrhoea, which the author thinks is usually caused by mild infection with *Shigella flexneri*, but occasionally by some climatic factor *per se*. Leprosy is described, in an excellent chapter, by Dr. John Lowe, whose long association with the disease is well known to readers of this *Bulletin*. It is enough to say that the account is full and clear, and is in line with modern views. Yaws, pinta and bejel are considered together, the account of the last having been written by Dr. Harry Senekjie ; the treponemal aetiology of pinta is accepted.

The chapter on tropical skin ulcerations is followed by sections on lymphogranuloma inguinale and granuloma venereum, and by a chapter on some common skin diseases.

Helminthic infections occupy 160 pages, as befits their importance. The section on filariasis due to *W. bancrofti* contains much the same information as the separate paper which was reviewed in this *Bulletin*, 1944, v. 41, 1054. The worms are classified in several ways (and there are three tables which the student will find most useful) but the final classification adopted for purposes of description is according to the main sites of the pathological processes they engender :—intestinal parasites ; parasites of lymphatics, subcutaneous tissues and serous cavities ; blood flukes ; liver and lung flukes ; and worms that produce the main pathogenesis in their larval stage. It seems that any classification has unsatisfactory features. The accounts are excellent, especially of those infections which occur in India. The nutritional disorders of the tropics receive full treatment, and there is an interesting note on infantile cirrhosis of the liver by Dr. R. N. Chaudhuri. The anaemias are briefly described, and there are short chapters on snakes and rabies.

The author's experience has been gained chiefly in India, where he led an active and enquiring life for many years, in contact with all that was best of medical research between the two wars. The emphasis of the book is, therefore, inevitably on Indian conditions, and reflects the very great amount of research that has, in fact, been done there. It is primarily a clinician's book, but the pathological and parasitological aspects are also very strongly written. It is not so full in matters of public health control, but that is not peculiar to this text-book. There is a great need for a modern book on tropical public health measures. As was stated at the beginning of this review, this is an excellent book, which can be recommended without reservation. The author has a very individual style which is an added attraction, and there is no woolly writing.

Some of the half-tone plates are not clear, and the coloured plates could be greatly improved. *Charles Wilcocks.*

KRAUS, Heriberto. **Tratamientos Modernos de las Enfermedades Tropicales de Colombia. Guia para el Medico Practico.** [Modern Treatment of Tropical Diseases in Colombia. A Guide for the Practising Physician.] 343 pp. 1945. Bogota.

This is a graduation thesis, and in his foreword Professor Camargo says : " Among us, where scientific publications are so scarce, the work of Heriberto

Kraus is meritorious." The title describes accurately the substance and aim of the work, which bears testimony to the zeal and application of the author and to his facility for abstracting and extracting, but it contains no original contributions. It deals with most of the diseases met with in Colombia; the causes, transmission, symptoms, diagnosis and prognosis receive little more than a mere mention, and the title does not warrant our expecting more, but treatment is fully dealt with. Quotations and references abound; in fact, the whole is a compilation, the authors quoted and the references to the literature being fully noted in each case. The author has made full use of the *Tropical Diseases Bulletin*; of 228 foreign, that is non-Colombian, references, no less than 155 are to this *Bulletin*, and this is amply acknowledged in the author's introduction.

In the cases of malaria, leprosy and yellow fever, fuller descriptions of the clinical aspect are given; in others the diagnosis section comprises merely a list. One example may be given. Under lymphogranuloma inguinale, called here *Lymphogranuloma venereum*, we are told that Brumpt proposes that the causal agent should be named *Miyagawanella lymphogranulomatosis* nov. sp. and that in diagnosis the disease must be differentiated from "soft chancre, suppuration of the legs [presumably adenitis secondary thereto], tuberculous inguinal adenitis, filarial adenitis, inguinal hernia, gonorrhoea, syphilis, inguinal granuloma, carcinoma or tuberculosis of the rectum, amoebic or chronic bacillary dysentery." No details are given regarding the general or differential diagnosis between these.

A work such as this does not call for a minute review. Suffice it to say that the work of extraction has been carefully done and consequently the Guide is a good one for the medical practitioner in the tropics at the present time. If it is to retain its usefulness revision will have to be frequent as new drugs are brought forward or new methods found beneficial and old ones replaced. There is no mention of food poisoning of any kind—rather a notable omission—and fish poisoning is concerned only with those which poison by their spines.

We have tested most of the directions and many of the references and found that the former are up to date and the references correct. Professor Camargo calls the work a "minute and happy compilation of treatment", which indeed aptly describes the publication. *H. Harold Scott.*

PINEY, A. [M.D., M.R.C.P., Physician, St. Mary's Hospital for Women & Children, London, etc.] & HAMILTON-PATERSON, J. L. [M.D., M.R.C.S., Pathologist, Redhill County Hospital, Edgware, etc.]. **Sternal Puncture. A Method of Clinical and Cytological Investigation.** With a Foreword by the Rt. Hon. Lord HORDER, M.D., F.R.C.P. 3rd Edition. pp. xv+80, 13 pls. (12 coloured) & 2 figs. 1946. London: William Heinemann—Medical Books—Ltd. [15*s*.]

The procedure of sternal puncture as an aid in the diagnosis and study of abnormal conditions in the bone marrow is of recent origin, but has proved so useful that it is now widely practised, and there is a considerable literature on the subject and on the applications of the technique.

The authors have attempted to supply medical practitioners with a concise handbook giving a short account of the main types of marrow derangement and their correlation with the blood picture in each case.

Chapter I gives a useful account of the normal myelogram, which must form the background against which the changes found in the bone marrow in various pathological states must be considered and the account, if over-concise, is probably sufficient with regard to the scope of the whole work.

There follow eight chapters on various blood disorders, with descriptions of the changes seen in the bone marrow, a mass of material which cannot be dealt with, in detail, in a short review, but on which a few general remarks are made below.

The last chapter gives a description of the technique of sternal puncture with, rather incongruously, accounts of methods used for vital staining and dark ground illumination of the material obtained, as well as an account of mitosis.

The arrangement of the coloured plates opposite the letterpress they illustrate is good, and the plates themselves are well reproduced, with the possible exception of that illustrating the bone marrow in malaria, where the representation of gametocytes and schizonts would be of little help in their identification in an actual preparation.

The treatment of the subject matter of the chapters on various pathological states of the bone marrow suffers from the limitations of the very *raison d'être* of such a book, *i.e.* an attempt at condensation of material not easily condensed. As an extreme example of this, Chapter III may be cited. The entire chapter, the subject of which is " Leukaemoid Reactions " consists of 25 lines and two words. The vagueness of the statements in this chapter, apart from its extreme brevity, would defy attempts to extract useful information from it, either by the student or the professional haematologist. Another drawback to the book, probably due to the same cause, is the omission of some conditions one would have expected to see included, such as Cooley's anaemia or erythroblastic anaemia and, among the protozoal diseases, infections with *Trypanosoma cruzi.*

Typographical errors are too numerous, indicating hasty proof reading, and there are other mistakes possibly due to the same cause. For instance on page 32 the use of the word " chapters " instead of " sections " is completely misleading. In the section on protozoal infections there are some misleading statements. It is stated, for instance, that liver puncture does not usually give very satisfactory material for examinations. This is the reverse of true for kala azar since the material obtained by sternal puncture may sometimes show very few parasites although these are numerous in the spleen or liver of the same patient.

The index to the book can only be described as extremely incomplete, and is of very little use for locating any particular subject dealt with in the text.

Apart from the defects pointed out above the book would appeal to the undergraduate student, who would find in it a review of the subject giving information which could only be obtained otherwise widely scattered in the literature on haematology, but the specialist and the worker in the tropics would probably prefer to consult the originals from which it is condensed.

H. E. Shortt.

Roy, D. N. [M.D., D.T.M., Professor of Medical Entomology, School of Tropical Medicine, Calcutta]. **Entomology (Medical and Veterinary).** pp. xii + 358, 162 figs. & 11 pls. 1946. Calcutta. Saraswaty Library, C18 & 19 College Street Market. [Rs. 30.]

This volume is finely produced and illustrated, and its general scope and arrangement at first sight suggest that it is well suited for the use of the medical officer in the tropics. Professor Roy is, of course, fully qualified to write on Indian entomology, and his account of certain aspects of his subject is excellent ; unfortunately, however, this standard is not fully maintained when dealing with arthropods whose importance is most marked in countries other than India.

The book is published in India, but, since no statement to the contrary is made, it is presumably also intended for workers outside that country. The

sub-title of the book indicates that the scope of the work is intended to cover veterinary as well as medical entomology, and, indeed, the author states in his preface that the book was written " with the object of providing medical and veterinary students also public health workers with a treatise containing up-to-date information on the life history and bionomics of disease-carrying insects." This is a wide field, and, although the author does not separate the subjects, the reviewer proposes, for the sake of clarity, to consider the veterinary and medical approaches separately.

So far as the veterinary aspect is concerned, the reviewer is of the opinion that the information provided is usually inadequate for a serious student and that it is seldom up-to-date. To quote examples : amongst the Diptera the part played by mosqutioes in the transmission of equine encephalomyelitis and Rift Valley Fever is not referred to ; no description is given of the important part played by *Culicoides* in the transmission of filariasis to domestic stock ; and it is stated that " *O. gibsoni* and other species of *Onchocerca* are possibly transmitted by *Simulium* (Cleland, 1927)" (p. 177). *Habronema muscae* is mentioned as a parasite of the house-fly (p. 195), but no mention is made of *H. megastoma* or of the fact that, as a result of transmission by house-flies, the adult forms of these helminths occur in equines. *Stomoxys* (p. 221) is referred to as a vector of surra, but no indication is given that it also transmits *H. microstoma* and *Setaria cervi* to domestic animals and *Hymenolepis carioca* to domestic fowls. Calliphorine myiasis is of vast importance to students of veterinary medicine, but the subject is dismissed in a few lines, and no reference is made to causal factors or to control. The important genus *Hypoderma* (p. 218) is almost equally cursorily dealt with, and the short description contains many inaccuracies—thus : " The larvae of *H. bovis* are large and of greenish brown colour whereas those of *H. lineatum* are smaller and brownish grey. The larval life of *H. lineatum* is also much shorter ". " The effect of the parasite, *H. bovis*, on cattle is very serious. The growth is inhibited and the production of milk is reduced." " It is not known how the larvae find their way to the animal's back as the eggs are always laid on the lower parts." The account of the *Mallophaga* (p. 280) is inadequate and contains the somewhat misleading statement that the insects belonging to the order " are generally parasites of birds, and one genus, *Trichodectes*, is found on mammals." The statement (p. 300) that " The causative organism of Texas fever is *Babesia bovis* or *B. begeminum* [sic] and is transmitted by *B. annulatus* and *B. decoloratus* Koch " suggests the quite untenable view that *B. bovis* and *B. bigemina* are identical. Psoroptic mange is one of the most important subjects to be dealt with in veterinary entomology, but Dr. Roy dismisses it in some ten lines, and these contain several inaccuracies, thus : " Scabies or mange in cattle is a specific disease of the skin caused by *Psoroptes communis* var. *bovis*. In sheep *Otodectes* produce the same type of disease." (p. 330).

As regards the value of the book from the medical aspect, the situation is somewhat different ; the Culicidae and the Muscidae and their relation to disease are adequately and clearly described, although there are many statements which require alteration or amendment. For instance, when describing the method of immunization against yellow fever, Dr. Roy writes (p. 139) ; " The person to be immunised is given a suspension of mouse-fixed yellow fever virus followed immediately by immune yellow fever serum from a recovered case of yellow fever or from a previously immunised person." This is obviously out of date and should be re-written. On page 52 it is stated that " In addition to malaria it is possible that some anophelines are capable of conveying the larvae of *Wuchereria bancrofti*." Later, reference is made to the transmission of filariae by anophelines in India, but their importance in Africa is omitted. Such generalized inaccuracies followed by subsequent corrections are not

uncommon. Thus, it is surprising to find (p. 244) that canine and infantile leishmaniasis are included amongst the diseases transmitted by fleas, although previously (p. 164) it is correctly stated that both diseases are transmitted by *Phlebotomus*. Again (p. 215), *Cordylobia anthropophaga* is referred to as laying her eggs " on the ground where there is smell of animal or human perspiration," followed by the statement that " the life history is incompletely known." Yet on the next page reference is made to the paper by Blacklock and Thompson in which the life-cycle is completely described. Most unfortunately, some gross inaccuracies remain uncorrected throughout the book. When describing the life-cycle of *Dermatobia hominis* Dr. Roy writes as follows : " The eggs are laid on leaves and branches of trees which become attached to the ventral surface of the abdomen of [the] mosquito which mechanically transfers the first stage larva contained in the egg to the skin of animals." Almost equally misleading is the statement that " Its presence in man is indicated by a painless tumour on the skin." Similar types of inaccuracy are allowed to remain uncorrected when dealing with such an important vector of disease as *Trombicula* (pp. 319–321), the description of which contains the following statements : " Only two species are of medical importance as they transmit in their larval stages the virus of a typhus-like fever ; these are *Trombicula akamushi* (Japan) and *T. deliensis* (Sumatra, Java and India). The larval *T. akamushi* Brumpt is decidedly more reddish in colour than the larval *T. deliensis* Walch . . . . Any transmission experimental work with *T. deliensis* is not easy. The adult mites of both sexes can be obtained often in large numbers from the ears of field rats . . . . . There is evidence to suspect that other arthropods in addition to mites probably also act as vectors. However, mites appear to be the most important transmitting agent known at the present time." On page 305 the only animal reservoir given for *Rickettsia orientalis* is the bandicoot. This statement is correctly copied from a short paragraph which appeared in the *Lancet* of January 31st, 1942, but the error has frequently been corrected in more recent articles on the subject.

The reviewer has pointed out these shortcomings and discrepancies, not with a view to destructive criticism, but in order to show that the book in its present form does not fulfill its avowed object of providing " up-to-date information on the life-history and bionomics of disease-carrying insects." If the book were confined to medical entomology, and if those portions of it which deal with aspects of the subject outside India were brought to the same standard of excellence as is reached in the description of the Indian culicidae, the work would fulfil a useful purpose.

As already stated, the general production and illustrating are excellent, but proof-reading has been insufficient and many typographical errors and mis-spellings remain uncorrected. *R. M. Gordon.*

TOUMANOFF, C. [Docteur ès Sciences (Sorbonne), Chef du Service d'Entomologie médicale aux Instituts Pasteur de l'Indochine]. **Les Tiques (Ixodoidea) de l'Indochine. Recherches faunistiques avec indications sur les Ixodidés des pays voisins. Notions générales sur la biologie et les moyens de combattre ces Acariens.** [The Ticks of Indo-China ; Biology and Methods of Control.] pp. II+220, 94 pls. [Bibliography.] 1944. Saigon : Instituts Pasteur de l'Indochine.

In 1924 the Government of Cochin China instituted the " Laboratoire d'Entomologie et d'Hygiène," the primary work of which was directed towards the study of the mosquito vectors of malaria and other diseases of man and animals. Since the opening of the laboratory, the staff have already published two monographs on mosquitoes, the first by BOREL in 1930 [this *Bulletin*,

1931, v. 28, 335] and the second by TOUMANOFF in 1936 [*ibid.*, 1937, v. 34, 517]. The activities of the laboratory have, however, also included the study of various other arthropods of medical and veterinary importance, and, in addition to the present monograph on ticks, studies on fleas in relation to plague, and the rôle of tabanid and other flies in relation to surra, are in process of completion.

Dr. Toumanoff divides his work into five parts. The first is devoted to the technique employed for collecting, preserving and examining the material. These methods conform to the usual standards, but the author refers to his lack of success when collecting ticks from herbage by drawing a flannel cloth over the area. For observing the morphology of the tick by direct illumination, the author describes and figures a simple viewing-board, which can be attached to the mechanical stage of the microscope, and which is grooved in two directions in order to receive a circular glass disk, to the centre of which the tick is temporarily attached. The remainder of the first part of the monograph consists of a brief but admirably clear description of the external anatomy of the Ixodoidea, the terms used for the various parts, and the classification adopted. Dr. Toumanoff has accepted the general classification of Neveu-Lemaire, in what is referred to as his " recent work " (it was published in 1938), but for defining the characters in each group he has followed Aragão and, mainly for genera not referred to by Aragão, Brumpt.

The bulk of the work—some 118 pages out of a total of 200—is devoted to a systematic description of the ticks recorded from Indo-China, of which the author describes 39 species in the family Ixodidae and two in the family Argasidae. Of the latter only *Argas vespertilionis*, a parasite of bats, has been found by the author, although *A. persicus* is said to occur in the Far East. In the reviewer's opinion the value of a systematic description can be estimated only when in use as a key, that is to say, when it is studied in conjunction with the actual specimens being described. Nevertheless, the description of each of these 41 species is not only concisely given, but is also accompanied by admirably clear and well-printed plates and text-figures, so that there seems little doubt that when this test is applied, all who are concerned with the identification of the ticks will be indebted to Dr. Toumanoff.

The third part of the monograph is concerned, first with the general biology of the ticks, and later with more detailed references to certain important genera and species.

In his introduction the author truly states that the study of the ticks affecting man and animals should be based on similar lines to those which have afforded invaluable information concerning the relationship of various species of *Anopheles* to malaria—a point too often forgotten, particularly in veterinary medicine, where sometimes little distinction is drawn between " a vector " and " an important vector". In the fourth part of his monograph Dr. Toumanoff deals generally with the rôle of ticks as transmitters of disease, including in his account certain diseases, such as tick-borne relapsing fever, which have not been recorded in Indo-China.

The fifth and final section is concerned with control. The subject is dealt with generally, with particular emphasis on the control of *Boophilus annulatus* var. *australis* in Cochin China. This part of the work and the sub-section devoted to personal prophylaxis, although sound and interesting, contain nothing new. The monograph ends with a short review of the natural enemies of the tick and their utilization in control.

In his foreword the author refers to his monograph as " a modest contribution to the subject of medical entomology in Indo-China." All workers in medical and veterinary entomology will place a higher value on this work, and will consider it a valuable contribution to an important subject.

It is unforunate that, in a volume otherwise so well presented, the stitching and outer covering should be of so poor a quality. *R. M. Gordon.*

PAMPANA, Emilio. **Epidemiologia della malaria. Studi di Medicina e Biologia.** [The Epidemiology of Malaria.] 403 pp., 92 figs. & 2 folding pls. 1944. Rome: Editrice Nazionale. [L.480.]

This comprehensive text-book on the epidemiology of malaria presupposes in the reader a fundamental knowledge of the clinical manifestations, pathology and parasitology of the disease. It contains clear and concise accounts of the endemic and epidemic phenomena that characterize malaria in all parts of the world, and few, if any, important contributions to our knowledge of the epidemiology of the disease have escaped the author's attention. To bring together so much miscellaneous material, and to build it up into a coherent, very readable, treatise is a difficult task that the author has accomplished with distinction. Each chapter has an adequate list of references to the literature. Subjects treated include: characteristics of malaria infection and the cycle of its transmission; distribution of malaria in space and time; climatic, telluric and socio-economic factors in the epidemiology of malaria; various forms of endemic malaria; epidemic, endemic and hyperendemic malaria; anophelism without malaria and regression of malaria; and a wealth of information concerned with the carrying out of a malaria survey.

The book was produced in difficult conditions and *errata* are unduly numerous, but these are but small blemishes to an otherwise admirable volume.

Norman White.

DOELEMAN, H. **De malaria-epidemie te Middelburg in de jaren 1940 tot en met 1945, benevens een onderzoek van parasietendragers.** [The Malaria Epidemic at Middelburg 1940–1945 and Parasite-Carriers.] [Thesis for Doctorate of Medicine, Univ. of Leiden.] 136 pp., 6 plans on double pls. & 2 graphs. [Bibliography.] English summary. 1946. Goes: Oosterbaan & Le Cointre N.V.

The freshness of a published doctorate thesis, with its reminder of how a subject has reached current maturity, is often one of its main attractions. Dr. Doeleman saw his first malaria patient in 1940, and as a student at Utrecht had never heard of malaria except as a tropical disease which was said to occur also in some places in Holland. Middelburg, the seat of his investigations on Walcheren, is the capital of the province of Zeeland and has earned fame, or notoriety, not only in the recent war but in days gone by. During the stay of the English ambassador, Cuthbert Tonstal, at the Spanish court in 1517, the Zeeland fevers were greatly dreaded and drew from him the comment that no one left the province without disablement. He thought that the Styx and the Acheron, rivers of Hell, must be situated close to this coast. An epidemic in the English Expeditionary Force which landed on Walcheren in 1809 and which was based upon Middelburg, reduced that force from 40,000 to 15,000 men. Drainage and agriculture in South Holland, just as in Scotland 200 years ago, banished epidemic malaria. Zeeland was freed from epidemic malaria by the beginning of this century. The "Zeeland fevers," however, were not all malarial. Among them were included typhus, the typhoid fevers and the dysenteries. Intermittent fevers and "bilious fevers" were not differentially diagnosed in the days when thermometers were not used, and there were no laboratory investigations. The malaria parasite was demonstrated by the apothecary Van der Harst in 1900, a year in which Berdenis van Berlekom Jr. described an epidemic at Middelburg.

Dr. Doeleman follows his excellent first chapter on the history of malaria in Zeeland with four more chapters which cover systematically the epidemic and its control ; investigation of parasite carriers ; the principles of the campaign, and epidemiological notes. Much of the information on the nature of the intermittent fevers of Zeeland has been culled from articles by Honig and Swellengrebel [this *Bulletin*, 1927, v. 24, 344] and due recognition is accorded to the first report, by Schouten, of the Malaria Commission of the Department of Health in 1920. It is to van Thiel personally that Doeleman expresses his thanks for support, and with his name are coupled those of other members of this Commission, Schüffner, Swellengrebel and de Buck. Hulshoff Pol is another of the authors to whose investigations Doeleman pays tribute. From the views promulgated by these authorities and from his own researches, Doeleman argues especially that the " healthy " parasite-carrier is the important and dangerous factor in the carry-over of malaria from the preceding autumnal months to the " relapses " in April and May of the following year ; that the disappearance of parasites on clinical examinations of those who have been given courses of quinine in autumn does not necessarily denote complete eradication ; that fresh infection takes place, beginning in July and August and reaching its height in the autumn months ; that healthy carriers do not sacrifice their " premunition," or symptomless equilibrium between parasite and host, by treatment with quinine ; and so on. Some of these features may be referred to in more detail according to the successive chapters.

In chapter II, on the Description of the Epidemic and its Control, we have the record of the author's own investigations and activity from 1942 onwards. He concentrated upon Middelburg, where malaria had shown signs of increase in 1940. It would seem that the author is not disposed to blame the bombardment of Middelburg in 1940, with ruin of the town and development of mosquito breeding places in the cellars, as more than merely one factor in the epidemic intensification, nor yet is he prepared to maintain that the inundation of Walcheren and the evacuation (11.9.44) of the people from the island banished malaria for the time being. Most of the inhabitants of Middelburg did not leave the town. The subject of relapse receives special attention ; a factor which, according to Korteweg, is the crux of what is, otherwise, benign tertian malaria. A reference is made to the zoophilism of mosquitoes, and to the finding of 20,000 *Anopheles* in abandoned horse stables. This is also referred to elsewhere and animals other than the horse are implicated, namely oxen, pigs, rabbits and poultry.

For control, Doeleman—while he does not in any way deprecate the value of work done on the breeding places of mosquitoes and the outhouses of human habitations—prefers to concentrate upon therapeutic measures designed to rid not only the human malaria patient, but also, and especially, the dangerous healthy parasite-carrier, of his plasmodia, and upon the detection of relapse cases. All methods of detection must be vigorously employed, blood examination, spleen examination and the like. As measures of prevention he recommends the spraying of houses in which malaria cases had occurred, with Shelltox, now likely to be superseded by DDT ; and the autumnal administration of quinine to the malaria patients of the previous year, in doses of 1 gm. of sulphate of quinine twice weekly on two successive days from mid-August to the end of October, that is, for a period of 8 weeks. It is to be noted that only quinine was available at this time. He does not minimize, however, the fact that this is a counsel of perfection, which takes no account of the ineffectiveness of spraying apparatus or the difficulty that confronts a practitioner in persuading a person who is " healthy " and uncomplaining, to take a long and regular course of quinine.

In chapter III, the investigation of parasite carriers is specifically dealt with. These are not restricted to children, as they seem to be in tropical lands (by which is probably meant hyperendemic regions); in Holland—where less malaria prevails—carriers are distributed among persons of varying age. If malaria is really to be prevented altogether there must be efficient treatment of every infected person, not only the malaria patient but also the healthy parasite carrier. The question of development of immunity is raised in order to stress the concept of "premunition," as defined by Sergent, which, as a latent infection and an equilibrium-toleration of parasite by the host, is compared with the allergic conditions of symptomless latency in tuberculosis and syphilis. Disappearance of parasites from the peripheral blood is well known and has been described as a retreat only to the spleen, or more correctly to the reticulo-endothelial system.

Chapter IV treats of the principles of campaigning against malaria. The importance of this section lies in its insistence on the difference between the ideal and the practical. Doeleman seems to consider that the length of the course of quinine had no demonstrable influence on relapses, and that a week's course of 1 gm. of quinine each day was economical, practicable and within the disciplinary power of the practitioner. In the second place, a knowledge of the bionomics of the mosquito and the time of the infectiveness of the *Anopheles* would save much futile effort. Thus, to mention one example only, the Dutch investigators have shown how much of the malaria of Holland is due to *Anopheles maculipennis atroparvus* breeding in brackish water, and how little, if any, is due to *messeae* which breeds in fresh water. The spraying campaign requires 0·4 to 0·5 litres of Shelltox per house, and the house remains for some 14 days repellent to incoming *Anopheles*, after which spraying must be repeated.

In his last chapter are various notes referring to malaria statistics; to the question whether malaria in Middelburg is endemic or epidemic, with the conclusion that it is endemic and that an epidemic is only an exacerbation; to the influence of live-stock on the persistence of malaria; to the prognosis of malaria in Walcheren, as reclamation of its inundation devastation proceeds; and it includes a short note on the problematical danger of therapeutic malaria infection in the treatment of dementia paralytica.

A hope is expressed by the author that his observations in Middelburg may be helpful to others faced with similar problems throughout Holland, and we think that perusal of this monograph would undoubtedly be of great service.

W. F. Harvey.

MAGOON, E. H. [M.S. in San. Eng., D. Eng., etc.]. **Drainage for Health in the Caribbean Area.** [Spanish translation by J. A. HERNANDEZ, C.E.] 556 pp., 80 pls. [Reprinted from Boletín Oficial *Salubridad y Asistencia Social.* 1945, Feb.–Oct., v. 48, Nos. 2–10.

The business of malaria control has reached a higher stage of development in the Americas than in many parts of the Old World, and there have grown up several classes of skilled people engaged in it. There is the technical specialist, to describe whom we only have the ugly word "malariologist", who is responsible for the general direction of policy and the preparation of schemes. There is a large class of malaria engineers specially skilled and practised in those branches of civil engineering on which malaria control may depend. There is also a group akin to our Sanitary Inspector, and under him a large class of skilled artisans normally engaged in anti-malarial works and having some special knowledge of the problems particular to them.

This book is intended for the instruction of all of these groups except the first, but mainly for the malaria engineer and the sanitary inspector. It gives

sufficient information about the general epidemiology of malaria and the conditions in the Caribbean area to enable them to understand the policy of control, and to adapt general recommendations to local conditions, but insufficient to enable them to initiate policy themselves. It gives in moderate detail the engineering aspects of malaria control in mangrove swamps, flood plains, seepage areas and the like, and full details of the equipment and materials commonly used. Hand tools, ditching machinery, concrete products, their manufacture, and similar subjects, are fully described from a basis of long experience of the most suitable types and methods, and data are given on such matters as the carrying capacity of ditches, the cost of ditching, and the construction of culverts and drainage outlets. Malaria control by other means is not ignored but is given in considerably less detail than are the mechanical measures aimed at the eradication of breeding places. The book ends with a series of tables, photographs and drawings which adequately illustrate the text.

For those people for whom it was intended, this work is undoubtedly of great value, not only to be read but to be kept for constant reference. For those engaged in malaria control outside the Caribbean region, much of the subject matter is inappropriate. The book is printed in parallel columns of Spanish and English, which lessens its convenience, and it contains much information on meteorology, tides, and local conditions which are unwanted beyond its original home. But this is all there is to be said in its disparagement. Such engineers and sanitary inspectors as are engaged in malaria control will welcome the profusion of detail on their craft which it supplies. The fact that they are few in number will make the book more acceptable to the doctor and specialist malariologist, who must perforce acquire a skill in these aspects of malaria control, which are handled commonly in the Americas by non-medical staff. Many of the methods advocated and illustrated may be considered too ambitious or elaborate, but by studying them we can learn what is considered normal in other parts of the world, and profit from the lesson. *G. Macdonald.*

DE WILDEMAN, E. [Directeur honoraire du Jardin botanique de l'Etat, etc.]. **A propos de médicaments antilépreux d'origine végétale. III. Les plantes utiles du genre** *Strychnos*. [Antileprosy Drugs of Vegetal Origin; Useful Plants of the Genus *Strychnos*.] *Institut Royal Colonial Belge. Section des Sciences Naturelles et Médicales. Mémoires.* (Collection in-8°.) 1946, v. 13, No. 5, 105 pp.

In this work the author has collected a large amount of information on the very numerous and special species of *Strychnos* in both the Old and the New Worlds, with valuable references to the literature and statements regarding the uses to which preparations from these plants have been put by the indigenous populations of the many countries in which they are met. After some notes on the alkaloids contained in these plants, which include forms of curare as well as strychnine and brucine, the author classifies them as (1) edible, (2) toxic (used medicinally or as poisons). No less than 44 species from the Congo are enumerated, and the great bulk of the publication is devoted to an alphabetical list of species of *Strychnos* found in many countries of the world, beginning with the edible, which number over 40 and which, with the exception of *S. spinosa* of tropical Africa and Australia, which has been most investigated, are dealt with very briefly. Similarly, over 100 noxious species are enumerated, mostly very briefly; the uses to which many of them are put by the indigenous inhabitants of the countries concerned are noted, but no evidence of their real value is given. They are most frequently used on poisoned arrows.

and as antidotes to snake bites. By far the longest account, eight pages, deals with *S. gauthierana* of Indo-China, the bark of which is reputed to be of value in the treatment of leprosy and other resistant skin diseases ; it is used together with chaulmoogra oil, which makes it difficult to judge the value of the *Strychnos* in leprosy. Among other diseases for which varieties of *Strychnos* are said to have been employed by the indigenous peoples are cholera, dysenteries, venereal diseases, scrofula, rabies, asthma, rheumatism, etc. This work contains much interesting information on local beliefs, but little of real medical value.

L. Rogers.

ADRIAENS, L. [Docteur en Sciences chimiques, etc.]. **Recherches sur la composition chimique des Flacourtiacées à huile chaulmoogrique du Congo Belge.** [The Composition of the Flacourtiaceae of the Belgian Congo in relation to their Content of Chaulmoogric Acid.] *Institut Royal Colonial Belge. Section des Sciences Naturelles et Médicales. Mémoires.* (Collection in-8°.) 1946, v. 15, No. 1, 87 pp.

It is a remarkable fact that trees belonging to the Flacourtiaceae, and bearing chaulmoogra oil, are to be found in a number of countries where leprosy is most prevalent ; these include India, Indo-China, Nigeria and other tropical African countries, and Brazil. The present monograph deals with the chemical constitution of oils from the seeds of such trees in the Belgian Congo, both indigenous and acclimatized. The author first deals briefly with the botanical classification of the chaulmoogra-bearing trees of the Belgian Congo, and with previous incomplete chemical analysis of the oils of the following Congo species, *Caloncoba welwitschii, C. glauca* and *Lindackeria dentata.* His own researches on the oils from the seeds of the three Congo species are given in detail ; they are based on the methods of COLE and CARDOSO (*J. Amer. Chem. Soc.*, 1938, v. 60, 615) in the Philippines, but the author's laboratory facilities were incomplete during war time. Table I shows that *C. welwitschii* oil contains 45 to 47 per cent. of fatty acids against 24 to 32 per cent. in the case of the other two oils ; so the first is far richer than the others in its medicinal properties, and is worthy of careful trial in the treatment of leprosy. Details are given of the esters in three fractions of each oil, separated by their boiling points, and of from 8 to 11 fractions of each of three main fractions, obtained by crystallization of the ethyl esters ; data on these boiling points and on the iodine indices are included. The interpretation of the results thus obtained is dealt with, and calculations are made of the amount of saturated and unsaturated fatty acids in each sub-fraction of the three oils, to determine the probable composition of each fraction. The identification of the various fatty acids is discussed, including chaulmoogric, hydnocarpic and gorlic acids in the unsaturated series, and oleic and palmitic in the saturated. The remaining residue consists mainly of "tarry acids" but also contains a little unseparated, unsaturated, fatty acid. These analyses are difficult. Table VII gives the ultimate analyses of the three Congo oils ; it brings out the important fact that *L. dentata* contains 50·75 per cent. of hydnocarpic acid, which the author mentions was found by ROGERS to be more effective than chaulmoogric acid in the treatment of leprosy, and only 11 per cent. of the less active chaulmoogric acid The caloncoba oils, on the other hand, contain from 30 to 45 per cent. of chaulmoogric acid and only 5 to 18 per cent. of hydnocarpic acid. An analysis of gorli oil, *C. echinata*, of tropical Africa, by Cole and Cardoso is quoted as showing only a trace of hydnocarpic acid, but no less than 75 per cent. of chaulmoogric acid and 15 per cent. of gorlic acid. *L. dentata*, however, contains little or no gorlic acid. The inactive palmitic and oleic fatty acids are also present in the Congo oils in proportions of 21 per cent. to 31 per cent.

In the second part of this work, similar analyses are given of the oils derived from *Hydnocarpus wightiana* and *H. anthelmintica*, which have been grown in the Belgian Congo. They show high content of hydnocarpic acid, low proportions of chaulmoogric acid; the first contains 12 per cent. of gorlic acid, but the second very little. Among the conclusions are that both *C. welwitschii* and *L. dentata* should furnish esters and sodium salts, and that their fractions, especially the lower melting point hydnocarpic acid fraction, are well worthy of trial in the treatment of leprosy. This memoir is a valuable one which should be consulted by all interested in the chemical composition of chaulmoogra oils as a class in relation to their use in the treatment of leprosy.

L. Rogers.

Pozzo, Adolfo. **Peste de Oriente.** [Oriental Plague.] Prologos de los Profesores Carlos Fonso Gandolfo & Carlos E. Paz Soldán. 259 pp., 77 figs. [Bibliography.] 1945. Buenos Aires: Editorial "Alfa," San Martin 693.

This systematic book on plague, in paper covers, should become a standard not only for the plague worker but for the practitioner. It has special importance, naturally, for Spanish South America and Brazil, and has detailed reference to Argentina. All aspects of plague are dealt with, beginning with biblical history and passing on to the history of its introduction into the New World. The date of arrival at Monte Video in 1899 of the Dutch cargo boat *El Zier* from India is one which is generally accepted as the beginning of plague in South America; and the whole historical subject is dealt with in the first 42 pages. Formal reference chapters on Bacteriology, Symptomatology and Pathological Anatomy follow and bring us to the important subject of Sylvatic Plague. An illuminating analysis is given of the spread of plague in its stages from the port to the towns and cities by the railway system, from railway stations to the country, and then further into the country, largely as sylvatic plague. The author objects to the term "sylvatic" as insufficiently descriptive, and would use the term "rural" as the antithesis to port or urban plague. As the argument on sylvatic plague develops, it seems evident that the main factor contributing to epidemic human plague is still the rat, although field and semi-domestic rodents do contribute, in a reverse direction, to initiate rat epizootics. This is a very important contention because it suggests that anti-plague measures against rodents must, for economic reasons if no other, concentrate upon the rat. Under present conditions it is hopeless and indeed impossible to deal effectively with the sylvatic rodent on a country-wide basis. Fortunately the danger of direct human infection from this source is more or less accidental and is likely to be confined to children or individuals who would utilize the pelt of a dead or sick animal. Prevention of such happenings can be effective up to a point by propaganda and by warning of this danger. "Rat-proofing" and rat annihilation are the preventive measures *par excellence* so far as rodents are concerned. In the Argentine, certain of the field rodents, some of them semi-domestic, are singled out for special reference. These are the Cuis (*Microcavia australis australis*) and Graomys (*Graomys griseoflavus griseoflavus*). Good illustrations are given of these as well as of the plague rats *R. norvegicus*, *R. rattus rattus* and *R. rattus alexandrinus*. Many photographs of places and procedure illustrate the text: line drawings of the differences between the fleas *Pulex*, *Nosopsyllus*, *Xenopsylla*, *Ctenocephalus*, *Leptopsylla* and *Ropallopsyllus*, based on head, thorax and abdominal characters, should prove useful. Other line drawings are of the "blocked" flea and of the distinctive features of the various species of the genus *Xenopsylla—cheopis*, *brasiliensis* and *astia*. The extensive bibliography would make a good foundation for a card-index to literature and has the great merit of giving the titles

of the papers as well as details of the publication. The work can be heartily recommended as sound and serviceable, and especially Seneca's aphorism, with which the text concludes :—

Longum iter est per præcepta, breve et efficax per exempla. *W. F. Harvey.*

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. PUBLICATION No. 18. Washington, D.C. 1942. 130 pp., numerous illustrations. **A Symposium on Relapsing Fever in the Americas.** [Edited by Forest Ray MOULTON]. [19*s*.]

The American Association for the Advancement of Science, unlike its British counterpart, embraces the applications of science in medicine and public health, and in recent years has published a series of volumes on important public health problems based on symposia arranged by the Section on Medical Sciences. Relapsing Fever in the Americas is the eighth of these volumes, and comprises a series of papers presented at a symposium held in December 1941, at the Dallas, Texas, meeting of the Association. The 23 contributors represent workers in very different branches of the subject and their papers are grouped together under seven headings :—introduction, distribution, parasitology, tick vectors, epidemiology, symptomatology and public health aspects.

The historical introduction includes interesting notes on the life of Obermeier, whose discovery of the spirochaete of European relapsing fever in 1868 opened a new chapter in scientific medicine, since in his day bacteria had not yet been specifically associated with human disease. His death took place when only 30 years old, as the result of injecting himself with blood from a moribund cholera patient, in the hope of elucidating the cause of the malady.

The present distribution of relapsing fever in Oklahoma, California, Texas and Panama respectively, forms the subject of four contributions, and although comparatively few cases are recorded conclusive evidence is brought forward in support of the view that the infection is widespread in the animal population, especially burrowing rodents. The vexed question of taxonomy is dealt with by H. G. JOHNSTONE who adopts WENYON's proposal that the generic name *Treponema* should be used for spirochaetes both of the blood and of tissue. With reference to the specific name, all relapsing fever spirochaetes are considered to constitute one species, *T. recurrentis*. It is suggested that each different type might be designated by its geographical locality, and specific intermediate arthropod host, *e.g. T. recurrentis* California, *Ornithodorus hermsi* strain ; or the *O. turicata* strain of *T. recurrentis*, Mexico.

The unity or plurality of species is discussed by Gordon E. DAVIS, who gives results obtained with three local (U.S.A.) vectors and their respective spirochaetes and with exotic species of ticks, supporting the view that host-specific relationship offers the most accurate approach to the subject. Useful technical details are summarized in the section on laboratory diagnosis and cultivation of the spirochaetes, which is followed by a discussion of the very complex problem of the relapse phenomenon in this disease. It is suggested by SCHUHARDT that the variable number of relapses (1 to 12) in tick-borne relapsing fever may be best explained in terms of the large number of possible antigenic phases, the number of these involved in each attack and relapse, and the continuing capacity of the spirochaetes to produce new antigenic variants.

The article on tick vectors and life-cycles by Gordon E. DAVIS summarizes information on 25 American species of *Ornithodorus*, of which only 5 are proved vectors to man. In addition R. A. COOLEY summarizes the specific characters and distribution of all known species of the genus, a total of 44. E. FRANCIS

describes observations on the longevity of *Ornithodorus turicata* and the persistence of infection with *Treponema recurrentis*. Some ticks which had been starved for long periods lived for at least ten years. Spirochaetes in virulent form survived in ticks that had been starved for five years, and 6½ years in ticks which had an initial starvation of 4 years followed by a second one of 2½ years.

The distribution of the spirochaete within the body of the tick is the subject of an interesting article by C. M. WHEELER. No recognizable spirochaetes were found in the salivary glands, even of proved infected ticks, but spirochaetes, as such, were recognizable in the gut contents up to at least 38 days after an infective blood meal.

H. L. WYNNS summarizes information on the epidemiology of the tickborne type of relapsing fever in the U.S.A. ; this is endemic in at least 13 of the far Western States, and is transmitted by at least two species of *Ornithodorus*, *O. hermsi* and *O. parkeri*. The symptomatology and therapy of ordinary relapsing fever are described by G. R. MAGEE, and that of the disease superinduced on neurosyphilis by D. H. LAWRENCE and J. L. TERRELL, who give a summary of their observations on a total of 147 patients inoculated with relapsing fever, including 123 syphilitics. The pathology and immunity are discussed by KEMP, VON HAAM, FISHER and EVANS, and the volume concludes with a discussion of public health aspects of the disease, by BOHLS.

This whole volume is a tribute to the work of the American Association and to M. H. SOULE, the Chairman of the Publication Committee and the Secretary of the Section which drew up the plans for the symposium. It provides a most useful summary of a subject which is becoming of increasing importance in the United States and also in Latin America. *E. Hindle.*

GOULD, Sylvester E. [M.D., D.Sc., Pathologist and Director of Laboratories, Eloise Hospital, Eloise, Michigan, etc.]. **Trichinosis.** pp. ix+356, 128 figs. & 1 pl. 1945. Charles C. Thomas : Springfield, Illinois. [27*s.* 6*d.*]

This is a very comprehensive treatise on the subject of trichiniasis. The incidence of infestation in the United States has been known to be high for years and many sporadic cases are probably missed and others wrongly diagnosed. The author's object in producing this work is " to bring the more important aspects of this disease to the attention of workers in the field of Medicine and possibly also to the attention of producers of pork." Ably indeed has the author carried out his task ; the subject as a whole, and every subdivision of it, have been discussed and described with a thoroughness which could hardly be surpassed. The writing is lucid and entertaining so that the reader never loses interest.

The book is divided into 13 chapters, and appended are an exhaustive bibliography of between 500 and 600 references, an index of authors and a very complete subject index. The author starts with an historical chapter, duly noting the first discovery of the condition by James PAGET in the dissecting-room when he was a first-year medical student at St. Bartholomew's Hospital, London, more than a century ago (February 1835) ; the discovery of it in the muscles of a hog by Joseph LEIDY of Philadelphia in 1846, and Virchow's experimental work in the 'sixties. In this chapter early outbreaks are mentioned, notably that of Hedersleben, Germany, in 1865, when 337 persons suffered and 101 died, a 30 per cent. fatality rate. In this preliminary chapter are mentioned, briefly, matters dealt with in more detail in subsequent chapters, *viz.* inspection of pork in Germany, where in 1895 inspectors numbered 27,089 in Prussia alone, a force " almost as large as the entire regular army of

the United States (28,238)" ; the importance of eosinophilia, discovered by T. R. Brown in 1896, when a student at Johns Hopkins University ; and immunity reactions.

Next follows a clear and detailed account of the life-cycle and morphology of the worm with excellent illustrations, and a chapter on its epidemiology, its incidence on race, sex, age, religion and occupation, and in various countries. Trichiniasis in animals comes next ; 28 animals are named as having been found naturally infested and 18 others as infestable experimentally. An important section is that on Pathology (Chapter VI, occupying 60 pages) amply illustrated ; it includes an interesting discussion on the predilection of the parasite for certain muscles. The reason is not yet decided, but it is not due to mechanical transportation by the blood stream ; it seems to be connected in no small degree with activity of the muscles and their glycogen content. Immunology is adequately dealt with ; the preparation of antigens, the complement fixation, precipitin, intradermal and other skin tests and their interpretation, non-specific reactions, failure of severe cases to react, the eosinophilia and its cause or possible causes ; the conclusion is that the eosinophilia is due to " stimulation of the bone marrow by foreign proteins arising from the larvae during their invasion of the tissues and development in the striated muscles, and by split products of the degenerated muscle tissue."

The author passes on to discuss laboratory diagnostic methods under various headings : (1) Blood changes ; (2) serology (immunological tests) ; (3) demonstration of adult worms or larvae in the faeces ; (4) finding of larvae in the muscles by the methods of compression, digestion, maceration, and by biopsy sections, and in the blood, cerebrospinal fluid, etc., and lastly, demonstration of larvae in meat suspected as being the infecting source.

A detailed account of the symptomatology of trichiniasis follows and a chapter on clinical diagnosis with a record of ten illustrative cases and, lastly, the question of treatment is discussed—physical methods, purgation, radiation, etc. ; the use of immune or convalescent serum, and drugs, among them thymol, santonin, oil of chenopodium and other anthelmintics, arsenicals, antimonials, mercurials, sulphonamides and a score of others ; none is specific and the long list adds more support to the old dictum that " a disease with many remedies has no cure." None of them seems to act specifically on the parasite while it is in the bowel, or during its migration or when it invades or encysts in the muscles.

In conclusion, to sum up, the work is interestingly written, well produced, printed clearly on good paper and fully illustrated ; is right up to date and should appeal to the physician and the veterinarian, to the pathologist, human and comparative, to the statistician and the medical officer of health, and can be strongly recommended. *H. Harold Scott.*

Colonial Office. **Labour Conditions in East Africa** [Browne, G. St. J. Orde, Labour Adviser to the Secretary of State for the Colonies]. Colonial No. 193. 94 pp., 1 folding map. 1946. London : H.M. Stationery Office. [2s.]

This is a very complete survey of labour conditions in Tanganyika Territory, Kenya, Uganda and Zanzibar at the present time. The author, who has had long experience as an Administrative Officer and Labour Commissioner, toured these colonies from October 1944 to the end of March 1945, visiting mines, plantations, farms and various Government institutions. The main object of the visit was " to investigate the arrangements for the compulsory recruitment of labour and the conditions of employment of such labour, and also the question

of labour migration from Ruanda across the Belgian border; in addition the effect of war conditions on African labour was investigated and the whole subject was discussed with the Governments concerned."

In general, the African is a farmer cultivating for the maintenance of his family a portion of the tribal land of his village, but not owning the land. The work is shared by all the members of his household and he is largely independent of wages; his needs are few and simple and it is only when his crops fail through drought or other uncontrollable cause that he is compelled to go to work for wages. He can ordinarily leave his family for months confident that they will not starve and will be protected by tribal ties and obligations. With a special object, usually to gain a certain amount of money, he travels long distances—hundreds of miles—to work on sisal estates or plantations, etc.; higher wages, instead of attracting him to stay longer, merely enable him to leave earlier with the sum of money aimed at.

The author deals with labour conditions in relation to this background; such matters as the welfare of Africans employed on large estates or by Government Departments, including accommodation for families, provision of hospitals and schools and social amenities, questions of compensation for injury and illness, trade unions, the provision of camps on travel routes, precautions against the spread of disease, and many other important questions are discussed.

The needs of war produced some new industries and expanded existing ones; factories for textiles, leather goods, dried vegetables, dried milk, timber production, etc., were successfully developed, and the production of rubber, pyrethrum and sisal was increased.

Occupational training, the relationship of clerical and technical education to each other, domestic training for girls, juvenile labour, especially in towns, are important questions dealt with in this report.

The author shows the need for the establishment of properly equipped and staffed Labour Departments in these colonies, and suggests how they should be constituted. The Head should be a Labour Commissioner with a seat on Council; under him there would be Deputy Commissioners, a Medical Officer, a Trade Union Officer, and Labour Officers. The problems that will arise in the future make it necessary to appoint men with special knowledge of their branches.

Conscription of labour and the immigration from Ruanda-Urundi are discussed.

The Report is a most interesting one and will be of great value to all who may be concerned in the development of East Africa and the welfare of its inhabitants.

J. F. Corson.

HONIG, Pieter [Ph.D., etc.] & VERDOORN, Frans [Ph.D.]. [Edited by]. **Science and Scientists in the Netherlands Indies.** *Natuurwetenschappelijk Tijdschr. v. Nederl. Indië.* 1945. Vol. 102. Special Suppl. 491 pp., 134 figs. & 1 folding map. New York City: Board for the Netherlands Indies, Surinam and Curaçao.

This extensive symposium of articles on all branches of science was collected by the Board for the Netherlands Indies, and provides a summary of great historical interest. For the medical reader the chapters on the history of cinchona, the relation between soil and population density, rabies research, medical contributions from the Netherlands Indies, and medical education, will be of most interest. These chapters form a small proportion of the mass of information on many diverse subjects of scientific interest; the contributors to this volume are eminent in the subjects with which they deal.

Charles Wilcocks.

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(645) Wt. P8/313 10/46 S.E.R. Ltd. Gp. 432.

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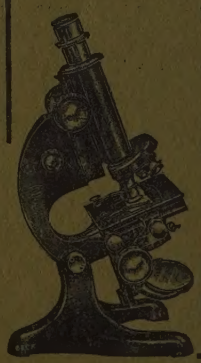

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